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OF USEFUL AND ENTERTAINING

KNOWLEDGE.

"GET WISDOM: AND WITH ALL THY GETTING, GET UNDERSTANDING."

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BIOGRAPHY.

BIOGRAPHICAL SKETCH OF SIR HUMPHREY DAVY.

The following sketch of one of the most eminent Philosophers of modern times, is from the pen of Mr. Jacob Green, Professor of Chemistry in Jefferson Medical College, and is prefixed to the American Edition of "Consolations in Travel," one of Sir H. Davy's last and most interesting works.

THE influence of external circumstances, on the developement and progress of genius seems to be generally admitted—yet a mind of genuine strength and energy will commonly push forward to conquest and glory in whatever situation it may be placed. The race, however, "is not always to the swift, nor the battle to the strong"—and the successful champion standing on the pinnacle of fame may often see, at a hopeless distance below, those who started with him in the same course, with equal natural endowments. It cannot be denied, that the highly gifted individual whose life we are about to sketch, affords an example of what is called a fortunate man—he commenced his career at a fortunate era in the progress of science—he was peculiarly fortunate in the facts which he discovered, and in the opinions which he espoused or advanced—yet no one will refuse to acknowledge that he possessed a mind original and clear in its apprehensions, and vigorous and extensive in its grasp—that he

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possessed strong reasoning powers, and that he united with all this a degree of patient and persevering industry rarely surpassed. Thus gifted by nature, and favoured by fortune, he obtained a reputation for sagacity and success which but few philosophers have ever acquired. In most cases the man of genius, during his life, seldom receives that admiration and justice from the world, which his talents deserve—but the public seem to have appreciated the value of Davy while he was yet living, and honours and rewards were heaped upon him by princes, philosophers, and people, long before he entered the hallowed precincts of the tomb.

Sir Humphry Davy was born at Penzance, in Cornwall, on the 17th of December, 1778. Having received the rudiments of a classical education under Dr. Carden, of Truro, he was placed with Mr. John Tonkin, a distant connexion of his mother, for the purpose of acquiring a knowledge of surgery and pharmacy. His genius was originally inclined to poetry; and there are many natives of Penzance who remember his verses, written at the early age of nine years. He cultivated this bias till his fifteenth year, when he became the pupil of Dr. Borlase, of Penzance, an ingenious surgeon, intending to prepare himself for graduating as a physician at Edinburgh. At this early age Davy laid down for himself a plan of education, which embraced the circle of the sciences. By his eighteenth year he had acquired the rudiments of botany, anatomy, and physiology, the simpler mathematics, metaphysics, natural philosophy, and chemistry. But chemistry soon arrested his whole attention.

As far as can be ascertained, the first original experiment performed by him at Penzance, was for the purpose of investigating the nature of the air contained in sea-weed. His instruments, however, were of the rudest description, manufactured by himself out of the motley materials which fell in his way: the pots and pans of the kitchen, and the phials and gallipots of his master, were without the least reserve put in requisition. While upon this subject, the following anecdote may not be uninteresting:—

A French vessel having been wrecked near the Land's End, the surgeon became acquainted with young Davy, and, in return for some kind offices, presented him with his case of surgical instruments. The contents were eagerly turned out and examined; not, however, with any professional view of their utility, but in order to ascertain how far they might be convertible to philosophical purposes.

The most humble means may undoubtedly accomplish the highest objects—the filament of a spider's web has been used to measure the motions of the stars—and now the worn-out tools of a surgeon's chest furnished one of the first philosophers of the age with the first

instruments of an inquiry, which terminated in results of the greatest practical importance to man. That this incident materially influenced the success of Davy as an experimentalist, cannot be doubted. Had he in the commencement of his career been furnished with all those appliances which he enjoyed at a later period, he might never have acquired that wonderful tact of manipulation, that ability of suggesting expedients, and of contriving apparatus, so as to surmount the difficulties which must constantly arise during the progress of the philosopher through the unexplored regions of science. In this art Davy certainly stands unrivalled; and, like his prototype Scheele, he was unquestionably indebted for his address to the circumstances which have just been alluded to.

We now find young Davy fairly embarked in that interesting career which he pursued with so much brilliancy and success during the rest of his life. By mere accident he became, at this time, known to his townsman, Divies Gilbert, Esq. now member of parliament, and the President of the Royal Society. It was this fortunate circumstance that early removed him from the obscurity of his native village, and placed him in a situation highly favourable to his progress in science. Mr. Gilbert remarks, that when Davy was about seventeen, the first experiment which gave him a strong feeling of the merit of the young philosopher, was a contrivance he devised to prove the immateriality of heat. This opinion, which he thus early embraced, he defended with great ingenuity and success in his maturer years.

Through the medium of Mr. Gilbert, young Davy became known to Dr. Beddoes, who had just established at Bristol his Pneumatic Institution, for the purpose of investigating the medical powers of the different gases. The Doctor proposed to Davy, who was then only nineteen years of age, to undertake the necessary experiments on this subject, a proposition which he eagerly embraced, on the manly condition that he should have the full and uncontrolled superintendence of all the processes. Thus his original design of going to Edinburgh was suspended, and a wide and interesting field of philosophical research was opened before him.

With Dr. Beddoes Davy resided for a considerable time, and was constantly occupied in new chemical investigations. Here he discovered the respirability of nitrous oxide, and made a number of laborious experiments on gaseous bodies, which he afterwards published in his "Chemical and Philosophical Researches," a work which was well received in the chemical world, and created a high reputation for its author, at that time only twenty-one years of age. This led to his introduction to Count Rumford; and having delivered some lectures at Clifton previously, he was elected Professor of

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Chemistry to the Royal Institution in London. On obtaining this appointment, Davy gave up all his views of the medical profession, and devoted himself entirely to chemistry.

It would not be difficult to cite many personal anecdotes in order to show the alteration effected in the habits and manners of Davy by his elevation. Look at him in the laboratory at Bristol, pursuing with eager industry various abstract points of research; mixing only with a few philosophers, sanguine like himself in the investigation of chemical phenomena, but whose knowledge of life and manners was bounded by the walls of the institution in which they were engaged. Change the scene—could the spells of an enchanter effect a more magical transformation? Behold him in the theatre of the Royal Institution! surrounded by an aristocracy of intellect, as well as of rank, by the flower of genius, the *elite* of fashion, and the beauty of England—whose very respirations were suspended in their eagerness to catch his novel and satisfactory elucidations of the mysteries of nature! We admit that his vanity was excited by such extraordinary demonstrations of devotion—that he lost a portion of that simplicity which constituted the charm of his character, and assumed the garb and airs of a man of fashion. But the charms of fashionable society did not allure him from the pursuits of the laboratory.

While at Bristol, Davy exercised himself principally in one of the most beautiful departments of analytical chemistry. He not only investigated the property of most of the gases, but he ascertained the proximate elements of many organic substances. Those discoveries, however, which enrol his name among the few destined to go down to the latest posterity, were made in London, at the Royal Institution. Here was a wide field for the display of his talents, and the powers of the galvanic battery, an instrument of analysis but recently introduced into chemistry, offered a fit subject for the exercise of a mind, patient in investigation, rapid in thought, and fertile in invention. The electro-chemical researches of Davy afford perhaps the most perfect specimen of philosophical induction ever recorded—but we must not anticipate our subject.

Davy's first experiments as Professor of Chemistry in the Royal Institution were made on the substance employed in the process of tanning, with others to which similar properties were ascribed, in consequence of the discovery made by Mr. Seguier, of Paris, of the peculiar vegetable matter, now called *tannin*. He was, during the same period, frequently occupied in experiments on galvanism.

In 1802 he commenced a series of lectures before the Board of Agriculture, which was continued for ten years. It contained much popular and practical information, and was among the most useful of his scientific labours; for the application of chemistry to agriculture

is one of its most important results. So rapid were his discoveries on this subject, that in preparing his discourses for publication, a few years afterwards, he was under the necessity of making several alterations, to adapt them to the improved state of chemical knowledge, which his own labours had, in that short time, produced.

In 1803 he was elected a fellow of the Royal Society, and in 1805 a member of the Royal Irish Academy. He now enjoyed the friendship of the most distinguished literary men and philosophers of London, and enumerated among his intimate friends, Sir Joseph Banks, Cavendish, Hatchett, Wollaston, Children, Tennant, and other eminent men. At the same time he corresponded with the principal chemists in every part of Europe. In 1806 he was appointed to deliver, before the Royal Society, the Bakerian lecture, in which he displayed some very interesting new agencies of electricity, by means of the galvanic apparatus. Soon afterwards, he made one of the most brilliant discoveries of modern times, in the decomposition of the fixed alkalies, which, in direct refutation of the hypothesis previously adopted, were found to consist of a peculiar metallic base, united with a large quantity of oxygen. By thus demonstrating that the earths and alkalies were metallic oxides, he opened entirely new views, with reference to the construction of the earth—the theory of volcanic actions—and of the most curious meterological phenomena. This union of electricity with chemistry, by ascertaining that galvanic action augments, reduces or inverts all chemical affinities, must for ever rank among the most splendid of theoretical investigations.

The reputation of Davy as a profound philosopher, may with perfect confidence be rested on the memoir which announces these discoveries. No higher proof could be given of the estimation in which these galvanic investigations were held by the most competent judges, than that given by the National Institute of France, who awarded to him on this occasion the splendid prize of Napoleon, valued at 3000 livres.

During the greater part of 1810, he was engaged in ascertaining the true nature of chlorine—and his researches on this subject changed the whole nomenclature of chemistry, and impressed a new form on many details of the science.

In 1812 he married the daughter of Charles Kerr, of Kelso, Esq. By his union with this lady, he acquired not only a considerable fortune, but the inestimable treasure of an affectionate and exemplary wife, a congenial friend and companion, capable of appreciating his character and attainments. The beautiful dedication of his "Elements of Chemical Philosophy" to his lady, will at once show his estimation of her moral and intellectual qualities.

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On the 9th of April, only two days previously to his marriage, he received the honour of knighthood from the Prince Regent, being the first person on whom his Royal Highness conferred that dignity.

Released now from the arduous duties of Professor of Chemistry in the Royal Institution, and possessing an easy fortune, his zeal and industry in the cause of science appears not in the smallest degree to have abated. The year 1815 is memorable for the invention of what has been termed the *safety-lamp*, for guarding against the explosions of fire-damp in coal mines—accidents which have often occasioned the death of many workmen. Most inventions have been purely or partly the result of accident—but Sir Humphry commenced with an experimental inquiry into the nature and properties of flame, the agent with which he had to contend, and reasoned out his contrivance from its principles with all the precision and accuracy of a mathematical deduction. Every one knows that his plans succeeded. But he did not simply disarm the foe—he made him his servant and friend—for in the most explosive mixtures, when this lamp is used, its flame gradually enlarges, its light increases, and this change gives the miner, instant warning of the approach of danger.

Some attempts were made to dispute the honour of this discovery with its author, but his claims were confirmed by the investigations of the first philosophers of the age. The coal owners of the Tyne and Wear evinced their sense of the benefits resulting from this invention, by presenting Sir Humphry with a handsome service of plate worth nearly two thousand pounds.

To a man of general science and literature, of activity, health, and easy fortune, nothing could be more gratifying than foreign travel. The subsequnt writings of Sir Humphry show how admirably qualified he was for such excursions, and the zeal and ingenuity with which he investigated the wonders of nature and art, wherever he could find them.

Many pages might be occupied with the interesting details of Sir Humphry's travels in different parts of Europe for scientific purposes, particularly to investigate the causes of volcanic phenomena, to instruct the miners of the coal districts in the application of his safety-lamp, to examine the state of the Herculaneum manuscripts, and to illustrate the remains of the chemical arts of the ancients. He analysed the colours used in painting by the Greek ancients and Roman artists. His experiments were chiefly made on the paintings in the baths of Titus, the ruins called the baths of Livia, in the remains of other palaces and baths of Rome, and in the ruins of Pompeii. By the kindness of his friend Canova, who was charged with the care of the works

connected with ancient Rome, he was enabled to select with his own hands, specimens of the different pigments that had been formed in vases discovered in the excavations, which had been lately made beneath the ruins of the palace of Titus, and to compare them with the colours fixed on the walls, or detached in fragments of stucco. The results of all these researches were published in the Transactions of the Royal Society for 1815, and are extremely interesting.

Painting was the favourite amusement of Davy in early life, and it is supposed that some experiments which he then instituted for the purpose of preparing colours, first directed his attention to the cultivation of chemistry.

On his examination of the manuscripts found in the ruins of Herculaneum, he was of opinion they had not been acted upon by fire, so as to be completely carbonized, but that their leaves were cemented together by a substance formed during the fermentation and chemical change of ages. He invented a composition for the solution of this substance, but he could not discover more than 100 out of 1265 manuscripts, which presented any probability of success. The obstacles thrown in his way by the jealous superintendents of the Museum at Naples, where they were deposited, induced him to abandon the enterprise of unrolling them. Thus the hopes of the scholar, with regard to these ancient writings, were in a great measure disappointed.

Sir Humphry returned to England in 1820, and in the same year his friend, Sir Joseph Banks, President of the Royal Society, died. Several discussions took place respecting a proper successor, when individuals of high and even very exalted rank were named as candidates. But science, in this case, superseded rank. Amongst the philosophers whose labours had enriched the Transactions of the Royal Society, two were most generally adverted to, Sir Humphry Davy and Dr. Wŏllaston; but Dr. Wollaston, who had received from the council of the Society the unanimous compliment of being placed in the chair till the election by the body in November, declined any competition with his friend Sir Humphry Davy. Sir Humphry retained his seat as President till the year 1827, when, in consequence of procrastinated ill health, in a great measure brought on by injuries occasioned to his constitution by scientific experiments, he was induced to retire again to the continent. He accordingly resigned his seat as President of the Royal Society, and the chair was afterwards filled by his early friend and patron, Divies Gilbert, Esq.

While on the continent, Sir Humphry continued to communicate the results of his unceasing scientific labours to the Royal Society,

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and at the anniversary meeting in 1827, one of the royal medals was bestowed upon him. His last great scientific effort was a plan to protect the copper sheathing on vessels from corrosion by sea water. It was grounded on the most legitimate deductions from the laws of electro-chemistry ; and although unexpected difficulties prevent the practical application of the discovery, yet the object sought for was fairly attained, and the philosophical inquiries and experiments which led to it, were precisely similar to those which produced the safety-lamp.

This great philosopher closed his mortal career at Geneva, on the 30th of May, 1829. He had arrived in that city only the day before, having performed his journey from Rome by easy stages, without feeling any particular inconvenience, and without any circumstances which denoted so near an approach to the grave. He had been for some months a resident at Rome, where he suffered a severe attack of paralysis, and from which he seemed slowly recovering—yet his most sanguine friends hardly ventured to hope that his valuable life would be much longer preserved. Lady Davy had joined him in Rome, on hearing of his alarming state, and also his brother, Dr. John Davy, physician to the British forces at Malta. His death was no sooner known, than the most distinguished inhabitants of Geneva offered their sympathies and services to the afflicted widow, and a long procession composed of the members of scientific societies, of manufacturers and artizans, followed his remains to the tomb.

Sir Humphry Davy having died without issue, his baronetcy, which was bestowed upon him in 1818, has become extinct.

Such is a brief and imperfect sketch of the life and discoveries of this great man. Many important facts might have been added to illustrate his high character as an inventive philosopher—facts which have given additional lustre to a fame, which has diffused a glory over the country which gave him birth, and the age which it adorns.

Sir Humphry Davy was well acquainted with foreign languages, and was in every respect an accomplished scholar. For the most part those pursuits which have early engrossed the powers of genius, and have been the means of opening the path to fame, create a disrelish for other objects, and a tendency to undervalue their importance. But Davy seemed incapable of any such exclusive feeling. His discourses as President of the Royal Society exhibit striking proofs of his liberal and enlightened views in every department of science—and in reading his Salmonia, or Days of Fly-fishing, it might be supposed that the author had devoted the whole of his time to he exclusive cultivation of natural history, and of elegant literature. In his youth we have said that he was addicted to poetry—and this

peculiar bent of mind seems never to have left him. In his Salmonia, and in the Consolations in Travel, both of which were composed on the bed of sickness, when all rational hope of a permament recovery had ceased, this original genius of his youth again burst forth—a spirit which it is said bestowed peculiar eloquence and interest on his public lectures. Apart from the scientific value of his labours and researches, they are pervaded by a tone and temper, and an enthusiastic love of nature, which are as admirably expressed as their influence is excellent. We trace no mixture of science and scepticism, and in vain shall we look for the principles of infidelity. The same excellent feeling breathes throughout "Salmonia," one of the most delightful labours of leisure ever seen. Not a few of the most beautiful phenomena of nature are here lucidly explained, yet the pages have none of the varnish of philosophical unbelief, or finite reasoning. We are told in the preface, that "these pages formed the occupation of the author during several months of severe and dangerous illness, when he was wholly incapable of attending to more useful studies, or of following more serious pursuits. They formed his amusement in many hours, which otherwise would have been unoccupied and tedious."

Some passages in this work indicate a pious tendency of mind which is more fully developed in the "Consolations," and which was composed just before his death. The force and beauty of the following extract from Salmonia, will be acknowledged by all;—"I envy, says Sir Humphry, no quality of the mind or intellect in others; not genius, power, wit, or fancy—but if I could choose what would be most delightful, and I believe most useful to me, I should prefer a firm religious belief to every other blessing; for it makes life a discipline of goodness—creates new hopes when all earthly hopes vanish, and throws over the decay, the destruction of existence, the most gorgeous of all lights; awakens life even in death, and from corruption and decay calls up beauty and divinity; makes an instrument of torture, and of shame the ladder of ascent to paradise; and far above all combination of earthly hopes, calls up the most delightful visions of palms and amaranths, the gardens of the blessed, the security of everlasting joys, where the sensualist and the sceptic view only gloom, decay, annihilation, and despair."

Berzelius, the distinguished professor of Chemistry at Stockholm, has characterized Davy as being the "clearest headed philosopher"—as "rendering every thing interesting that he touched." His character is constituted, says an American biographer, "of a very unusual assemblage of great and noble qualities—quickness of perception and patient thought—inventive genius and strong reasoning powers—perseverance to complete what ingenuity has begun—and

an eloquent tongue to utter what a profound and brilliant mind has conceived; these qualities were all interwoven in fine proportions to form its bright and varied tissue."

When we consider the benefits and the blessings derived by society from the labours and discoveries of Sir Humphry Davy—when we recollect the influence which his profound inductions and accurate reasonings have had upon the theory of natural science—we shall not be regarded as extravagant in pronouncing him one of the most eminently useful philosophers that ever existed, and as one of the brightest ornaments of genius that the world has ever produced.

NATURAL PHILOSOPHY.

MATTER AND ITS PROPERTIES

Matter may be defined to be, that which acts upon our senses, either directly, or by its effects. All matter, has the following common properties, *viz. Extension, Figure, Impenetrability, Divisibility, Inertia, and Attraction.*

Every particle of matter, however minute it may be, must necessarily have length, breadth, and thickness, and must consequently occupy some portion of space: this quality of matter is what we call *Extension.* It necessarily results that matter, having extension, must either be infinitely extended, which we know is not the case, or else it must have bounds, shape or *Figure. Figure* therefore, is an essential quality of matter. *Impenetrability,* as a quality of matter, has no reference to its being hard or soft, solid or fluid; but merely signifies that no two particles of matter can occupy the same place at one and the same time.

By *Divisibllity,* we are to understand that property by which matter is capable of being separated into two or more parts. Every body whether solid or fluid, has two sides, and of course, a middle; at least we know this to be the case with every piece of material substance that is large enough to be the subject of examination by our senses, and it is impossible for the mind to conceive of a particle so small as not to possess two halves and a middle: theoretically speaking, therefore, matter is not only *divisible,* but *infinitely* divisible: how far it is capable of being actually divided, whether to infinity, as the mathematician will readily demonstrate, or whether we may ultimately arrive at the original atoms, or parti-

cles, that are in their nature incapable of subdivision, is a question upon which a great deal of speculation has been expended without increasing the probability that it will ever be satisfactorily settled. However this may be, we do know that its actual division may be carried to an astonishing, and almost inconceivable extent. A single grain of gold for instance, may be beaten until it is reduced to the thirty thousandth part of an inch in thickness, and will cover the space of fifty square inches. Each square inch may be divided into 200 strips, and each of these strips into 200 parts; so that one square inch may be divided into 40,000 parts, each of which is vissble to the naked eye; now if these be multiplied by 50, the number of square inches which a grain may be made to cover, it will result that a single grain may be divided by manual operation into 2,000,000 parts, each of which is visible to the naked eye. If the same grain of gold be dissolved in a liquid, and in that state spread upon a smooth surface, and the liquor in which it was suspended be suffered to evaporate, the gold will be left, and cover a surface at least five times as great as when beaten out, and consequently, may be divided into not less than 10,000,000 parts, each of which may be seen without the aid of optical instruments! Wonderful as this fact may appear, a still more striking instance of the *infinite* divisibility of matter is exhibited in the fact, that a grain of musk, or any other fœtid substance, will fill a large room with its scent for many years, without losing enough of its weight to be detected by the most delicate balance. The particles of this musk, however, constantly float about in every part of the room, otherwise they could not come in contact with, and affect our olfactory nerves: how inconceivably small then must these particles be to be constantly flying off in such numbers as to occupy every part of the room, and yet not perceptibly diminish either the bulk or weight of the substance from which they proceed!

All matter when at rest, will remain so until some force, proportioned to the quantity to be moved, be applied to give it motion; this property of matter is denominated *Inertia*. The *inertia* of matter is strikingly demonstrated by a practice common with jugglers, &c. who to the great admiration of the ignorant will lie down upon two chairs, their head resting upon one, and their feet upon the other, place an anvil upon their breast and allow a person to strike it with all his strength, with a sledge hammer. We well know that were there nothing to intervene between the hammer and the person's breast, the blow would produce instant death; but the anvil being solid and heavy, and containing a large quantity, if we may so express ourselves, of the *vis inertia*, receives and resists it, so that its force is scarcely felt.

It is evident that matter can never put itself in motion; and it seems to be equally clear that when once in motion, it would forever continue to move in a right line, without any diminution of velocity, were it not resisted or operated upon by other matter. It is however, generally supposed, by those who have paid little attention to natural philosophy, that all bodies have a tendency to fall from a state of motion to that of rest; probably because they see that every thing to which motion has been given, as a cannon ball, for instance, soon falls to the ground and becomes stationary: they do not reflect that the ball is operated upon, and its motion retarded by the resistance of the atmosphere, and by the attraction of gravitation which constantly draws it towards the earth. Experience teaches us that the motion given to any body, is continued a longer or shorter time in proportion to the obstacles with which it meets, such as the resistance of the atmosphere, friction, gravitation, &c; and hence we may infer that were *all* obstacles removed, the motion given to a body would be perpetual; but until all these obstacles *are* removed, *perpetual motion* is as little likely to be discovered as the *elixir vitæ*, or a panacea for all diseases.

[To be Continued.]

PNEUMATICS.

The natural state of the atmosphere, like that of all material substances, is rest; but like every fluid, its equilibrium is easily destroyed; when this happens, it seeks to restore it again, and a motion is thus produced; this motion, when perceptible, is what we denominate *wind*, which is either a gentle breeze, a stiff breeze, a gale, a hurricane, or a tornado, according to the degree of its velocity.

There are many causes which operate in particular cases to destroy the equipoise of the atmosphere and put it in motion; but the two most general are, heat and cold: the former by rarifying, and the latter by condensing some portion of it to a greater degree than the surrounding parts.

However disastrous, and terrible to the seaman and mariner, and destructive to the inhabitant of *terra firma*, when roused to the fury of a tempest or torrado, yet currents in the atmosphere are among the wisest and most useful provisions of an all-wise Providence. Besides their vast utility in propelling the bark of commerce across the trackless ocean, and thus as it were, uniting distant portions of the world, making the inhabitants of one continent acquainted with those of another, and forming all mankind into one general commu-

nity, they are of incalculable importance in purifying the atmosphere, by dispelling those fogs, mists, and unwholesome exhalations which are engendered by heat and moisture, and which are so deleterious in their influence upon the human system. Nor is this all; the temperature of every country, in a great degree, depends upon its prevailing winds; at least they have a great influence on the climate, allaying the eccessive heat of the tropical regions, and moderating the extreme cold of the frigid, by traversing from the equator to the poles, and from the poles back again to the equator. In this country, and in all other countries lying north of the equator, the northerly, and easterly winds are generally cold and drying, because they come from a colder part of the country and have their capacity for moisture constantly increased as they proceed towards the south. The southerly winds, on the contrary, are warm and moist because they come from warmer regions and have their capacity constantly lessened as they proceed northward, and part with their warmth.

In some parts of the country there are winds which blow continually, for a certain length of time, in one direction, and then shift about and blow for the same length of time in an opposite direction: such are the *monsoons* in the Indian ocean which blow half the year one way and the other half the other way. In other parts we find the wind always blowing in the same direction, as the *trade winds*, for instance, which constantly blow from the north east and south east from within about thirty degrees of the equator, towards it, where those parts are not affected by the land. The *trade winds* are caused by the rarefaction of the air by the heat of the sun. The reason why the rarefaction of the atmosphere by the sun should produce a north east, and a south east wind, instead of an east, west, north, or south wind, may not appear very obvious; we will therefore endeavour to explain it. It will readily be understood that when any particular portion of air is rarified, it becomes lighter and rises above the surrounding parts which rush in to supply its place; currents are consequently formed towards that spot from every point of the compass. This is the case in the rarefaction of the air by the heat of the sun near the equator, but as those parts on which his influence is exerted are constantly being shifted towards the west, by the diurnal revolution of the earth towards the east, it follows that those parts of the air which are on the west side of the point of the greatest rarefaction have less motion than those on the east side, and consequently when the two currents meet, the motion of the former is overcome by that of the latter: were this all the effect of the rarefaction, it is evident that an east wind alone would be the result. But we must consider that there is a current of air rushing in both from the north, and from the south: now it is well known that the

union of two currents or forces of nearly equal strength, will produce a third current having a different direction from either of the others; a north and an east wind, for instance, uniting will form a north east wind, and a south and east wind, a south east wind: precisely in this manner are the *trade winds* formed.

It is difficult to account satisfactorily, for those sudden, irregular and violent gusts of wind which are principally confined to the tropical regions, and are known by the name of *hurricanes*. They sometimes spread over a large extent of country, carrying devastation in their progress, and prostrating fences, buildings, and even extensive forests in their course; at other times they are confined to a narrow space; in either case however, their route and bounds are distinctly marked. The causes of hurricanes and tornadoes have been variously attributed to sudden rarefaction, electricity, &c, but no very satisfactory reason has yet been given for their existence. A *whirlwind* is formed by the meeting of two or more currents of air, in such a manner as to produce a rotary, or circular motion. These are generally harmless, but they sometimes acquire such a force as to move and prostrate buildings which happen to be in their way: when these happen on large bodies of water, as they often do, particularly in tropical climates, they produce what is termed *a water spout:* the air in its rapid whirl, acquires a centrifugal motion, and recedes from the centre, in consequence of which a rarefaction, nearly amounting to a vacuum, takes place in the centre, into which the water is of course formed by the weight of the surrounding atmosphere; the upper part of the column of water thus formed up, coming in contact with the air which is in such rapid motion, is thrown off with such violence as to be converted into spray;—hence a *water spout* resembles, in appearance an inverted cone, or more properly, a mushroom, the column being the stem, and the spray forming the cap or top.

The following are the velocities of different winds as given by Mr. Smeaton, in the 51st, volume of the Philosophical Transactions.

1 mile	per hour,	hardly perceptible.
2 to 3 miles,		just perceptible.
4 " 5	"	gentle pleasant breeze.
10 " 15	"	brisk, stiff breeze.
20 " 25	"	high winds.
30 " 40	"	very high winds.
50	"	a gale.
80	"	a hurricane.
100	"	a hurricane that tears up trees, and carries buildings before it.

FERMENTATION.

Fermentation is the process by which liquors are changed from their original state to that of a vinous or ascetic. In this process, a certain degree of fluidity, heat, and air are necessary. All vegetable substances containing saccharine matter are susceptible of the vinous fermentation: any sweet vegetable juice, or other saccharine matter, will ferment if exposed undisturbed to a temperature of 60 to 80 degrees; it first becomes turbid and viscid, an intestine motion and increase of bulk takes place, air bubbles filled with carbonic ascid gas rise to the surface, and form a kind of froth or yeast. After a certain time these phenomena cease, a sediment is deposited, and the liquor again becomes clear, bright, and transparent; a vinous odour, intoxicating power, and brisk taste are developed. During the process of fermentation, the liquor acquires a higher temperature than that of the surrounding atmosphere, but if the temperature of the atmosphere be low enough to freeze the liquor, the fermentation will be arrested; it is never known to take place below the freezing point, and will not progress with rapidity if exposed to a less degree of heat than 55, Frht. After some days the vinous fermentation being complete, the process may be suspended, and the result will be a liquor, not sweet like that submitted to experiment, but one tart and pleasant. If, however, the temperature be low, the mixture of sugar weak, and no yeast be added, the acetous fermentation alone will take place. Saccharum or sugar is composed entirely of hydrogen, oxygen, and carbon. Cruikshank made many experiments on fermentation, and invariably found that on the addition of a fourth substance to the three which compose saccharine matter, no fermentation took place. He tried lime and a small quantity of potash, the addition of either prevented fermentation. The sugar which is a vegetable oxyde, in the process of fermentation, parts with a portion of its oxygen, which uniting with sufficient carbon, rises in the form of carbonic acid gas; the remainder becomes converted into alcohol by being partially deoxydized.

The intoxicating quality of all fermented liquors, whether wine, cider, or malt liquors, is owing to the alcohol which they contain.

The yeast or ferment, is a substance which separates under the form of flocculi, more or less viscid, from all the juices and infusions which undergo vinous fermentation. When it is required to preserve fermented liquors in the state produced by the first stage of fermentetion, it is usual to put them into casks before the vinous fermentation is completely ended; and in these closed vessels, a change very slowly continues to be made for some months. If the fermentation be suffered to proceed in open vessels, more especially if the temperature be raised to 90 degrees, the *acetous* fermentation comes on. In this operation the oxygen of the air is absorbed, and the more speedily in prrportion as the liquor is stirred, and the quantit of its surface exposed to the atmosphere.

NATURAL HISTORY.

THE BOHON UPAS TREE.

Antiaris Toxicaria. Lesch.

THE BOHON UPAS, or poison tree of Java, from the ingenious intermixture of truth and fable with which its early history was connected, presents one of the most remarkable fictions of modern times. The properties attributed to it were such as were calculated to excite the greatest astonishment as exceeding any thing injurious to animal life within the whole range of the vegetable creation. It was represented as a tree standing alone and unaccompanied by any other vegetable but in itself a living source of the most virulent poison, dealing instant death not only to any one who should have

the temerity to touch it, but exhaling such a pestilential atmosphere as to be immediately fatal to any living thing which came within its influence. The poison which was obtained from its trunk and used by the natives, was procured by means of criminals condemned to death, but whose punishment was commuted to the chance of their escaping with life from the hopeless attempt to approach the tree, an escape which could only be effected in the remote event of a favourable wind occuring to carry off the noxious vapour by means of which they could reach the tree in safety; a chance so rare as to render the commutation of little avail.

The true history of the Bohon Upas has of late years been investigated; and as usually happens with most of those relations which so highly interest the imagination all the marvelous characteristics attributed to it are found to be perfectly reconcilable with the ordinary laws of nature. It is to be regretted that the pages of natural history, which ought to be the record of rigid truth and fact, should be so often disfigured by relations either fabricated by unprincipled and mendacious narrators, or credulously received from ignorant and superstitious natives who are always willing to minister to the appetite of this class of men for the unnatural and prodigious.

It is not less to be regretted that such is the proneness in mankind to indulge in these monstrous creations of fancy that their influence often remains long after their utter falsity has been detected. The Bohon Upas has furnished the theme of much poetical illustration and will perhaps continue to exist among the machinery of the poet with the Hydras and Chimeras, the Mermaids and Gorgons and other monsters of a prurient fancy ignorant of the real and more truly remarkable wonders of nature. The poison called Upas and Ipo is used by the natives of the Molucca and neighbouring islands and has always been an object of curiosity from the wonderful effects said to be produced by it, and the exaggerated descriptions which travellers have received from the Indians of those places concerning it. The tree, as it is described by Leschenault, is large, rising to the height of 100 feet, and with a trunk of 18 feet in circumference at its base. It belongs, in the Linnean arrangement, to the monœcious class, or those having the stamina and pistils separate in different flowers on the same plant. It is usually found growing in fertile places, surrounded by other plants on which its neighbourhood has no sort of injurious effect. Its trunk is straight, and covered with a smooth whitish bark, and the wood whitish. The leaves generally fall before the flowering commences, and unfold again after the male flowers have blown; they are of an oval figure, of a tough leathery consistence, a pale green colour, rough to the touch, and covered with short hairs.

The flowers are of two kinds: the male which are numerous, and seated on a receptacle, are borne on a long footstalk or peduncle; the shape of the receptacle is much like that of a mushroom: the female flowers are solitary and have not the long peduncle of the male; the calix is thick and crowded with scales, the germen single, styles two, separating widely from each other. The juice of the trunk is very viscid, of a bitter taste and whitish colour, and exudes copiously from the tree, when an incision is made. The exhalations from the juice are like those which proceed from many kinds of euphorbia, sumacks, and the manchineal tree of South America, and are dangerous, particularly to certain constitutions which seem more liable to absorb the emanations, than others which are not affected by them. A Javanese was employed by Leschenault to procure flowering specimens from a tree, to effect which, he was obliged to climb the trunk; he had not ascended above 20 feet before he found himself affected with nausea and vertigo, and was obliged to stop and return; he continued sick for several days afterwards. Another Javanese employed for the same purpose, mounted to the top of the same tree, and brought away the desired specimens, without experiencing the least inconvenience. Leschenault himself had one of the trees cut down, and went frequently among the branches, and even rubbed the gum resin which oozed from the cut limbs on his face and hands, but felt no effect from it whatever. The various animals which inhabited the other trees in the vicinity, appeared to make no distinction with respect to the upas, but lizards and insects were as commonly observed on its trunk as on any other, and birds were as often observed perching on its branches.

The effect which the tree is thus found to produce upon certain temperaments, is not greatly different from that which characterizes the poison sumack *rhus vernix* of our own country. This plant usually grows as a bush or small tree, commonly in low swampy grounds, and on some constitutions it produces a very troublesome effect, not only when handled, but on coming within the exhalations which proceed from it. Painful eruptions and swellings are the consequence, while to others it is perfectly harmless.

The chief use which is made of the juice of the upas, is in the preparation of a poison with which the Indians of Borneo, Java, and other neighbouring places tinge the points of their arrows which they employ in the chase, or as weapons of war. The manner of preparing this poison is a secret confided only to a few individuals among the natives, whose influence and authority over the rest of the tribe are not a little enhanced by their knowledge of this dangerous secret. It appears to be used as an ingredient in a mixture of

several plants of acrid properties, which are boiled together until the decoction is evaporated to a proper thickness. Its effects then are extremely powerful.—Leschenault made several experiments with the arrows which had been medicated with it. Fowls wounded with them died in one, two, or three minutes, according to the greater quantity of the liquid which had been spread on the arrow points; and dogs wounded in the same manner, died in about eight minutes. They all expired in violent convulsions. When used in the chase, it did not appear that the flesh of the game killed with them, was at all affected by the poison.

The use of poisoned arrows is a custom common among uncivilized men of all nations, ancient and modern. We learn from history, that it was known among the ancient Scythians and Gauls. The African savages according to the accounts of Bruce, employ several of these wild plants, for the purpose of increasing the destructive effects of their rude weapons. Among those which he observed, he notices some kinds of euphorbia, and of the wild sumacks of those regions. Thunberg mentions that the Hottentots are in the habit of using for the same purpose, the venom of serpents and the juice of a vegetable, the *sideroxylum toxiferum*. The various tribes of South American savages have acquired the knowledge of the poisonous properties of many species of plants, which they convert to similar uses, as among the Javanese, and the mode of preparing them is entrusted to certain old men or magicians among them. These poisoned arrows were also known among some of the aboriginal tribes of our own continent, and one of the plants made use of was the *gonolobus macrocarpus*, of Michaux.

THE ICHNEUMON FLY.

The habits of these singular insects, bear so close an analogy to those of the little quadruped of the same name, that its appellation has very properly been borrowed, as indicative of its most remarkable peculiarities. There are many species of this fly, varying in size, though their general shape is similar to that of the wasp, with the exception of their oviposit, or long slender instrument by which their eggs are laid. Some of these species are furnished with an oviposit of most disproportionate length to the body to which it is attached. One species is commonly found in this vicinity, with an instrument of this kind, nearly three inches in length, although the size of the insect is not larger than that of a wasp.

They are all remarkable for the habit of selecting the larvæ of other insects, for the purpose of depositing in their bodies, their eggs, which are hatched in the living animal, and furnish the young ichneumon with its food. The peculiar instinct of these little animals is well described by Kirby and Spence in their invaluable store-house of entomological science.—"The instinct, they observe, of the ichneumon, is truly admirable, whose young are destined to feed upon the living bodies of other insects. These are so numerous, that scarcely an insect exists, but is in its larva state exposed to the attacks of one or other of them: and even the pupa, nay, the very eggs of these animals, are not safe from their insidious manœuvres. The size of the different species varies in proportion to that of the bodies which are to be their food: some being so inconceivably small, that the egg of a butterfly, not bigger than a pin's head, is of sufficient magnitude to nourish two of them to maturity; others so large, that the body of a full grown caterpillar is not more than enough for one. It is the larva of these ichneumons which make such havoc of our pygmy tribes: the perfect insect is a four winged fly, which takes no other food than a little honey; and the great object of the female is to discover a proper nidus for her eggs. In search of this she is in constant motion.—Is the caterpillar of a butterfly or a moth, the appropriate food for her young? You see her alight upon the plants, where they are most usually to be met with, run quickly over them, carefully examining every leaf, and having found the unfortunate object of her search, insert her sting into its flesh, and there deposit an egg. In vain her victim, as if conscious of its fate, writhes its body, spits out an acrid fluid, menaces with its tentacula, or brings into action the other organs of defence with which it is provided. The active ichneumon braves every danger, and does not desist until her courage and address have ensured subsistence for one of her future progeny.

Perhaps, however, she discovers by a sense, the existence of which we perceive, though we have no conception of its nature, that she has been forestalled by some precursor of her own tribe, that has already buried an egg in the caterpillar she is examining. In this case she leaves it, aware that it would not suffice for the support of two, and proceeds in search of some other yet unoccupied. The process is of course varied in the case of those minute species of which several, sometimes as many as 150, can subsist in a single caterpillar. The little Ichneumon then repeats her operations until she has darted into her victim the requisite number of eggs. The larvæ hatched from the eggs thus ingeniously deposited, find a delicious banquet in the body of the caterpillar, which is sure eventually to fall a victim to their ravages. So accurately,

however, is the supply of food proportioned to the demand, that this event does not take place until the young Ichneumons have obtained their full growth; when the caterpillar either dies, or, retaining just vitality enough to assume the pupa state, then finishes its existence; the pupa disclosing not a moth or a butterfly, but one or more full grown Ichneumons. In this strange and apparently cruel operation one circumstance is truly remarkable. The larva of the Ichneumon, though every day perhaps for months it gnaws the inside of the caterpillar, and though at last it has devoured almost every part of it except the skin and intestines, carefully all this time *avoids injuring the vital organs*, as if aware that its own existence depends on that of the insect on which it preys! Thus the caterpillar continues to eat to digest, and to move, apparently little injured, to the last, and only perishes when the parasitic grub within it no longer requires its aid. What would be the impression which a similar instance amongst the race of quadrupeds would make upon us? If, for example, an animal—such as some impostors have pretended to carry within them should be found to feed upon the inside of a dog, devouring only those parts not essential to life, while it cautiously left uninjured the heart, arteries, lungs, and intestines, should we not regard such an instance as a perfect prodigy, as an example of intrinsic forbearance almost miraculous?

Some Ichneumons, instead of burying their eggs in the body of the larva that are to serve their young for food, content themselves with glueing them to the skin of their prey, which the young grubs pierce as soon as hatched. Another tribe, whose activity and perseverance are equally conspicuous, which includes the beautiful genus Chrysis, and many other hymenopterous insects, imitating the insidious cuckoo, contrive to introduce their eggs into the nests in which bees and other insects have deposited theirs. With this view they are constantly on the watch, and the moment the unsuspecting mother has quitted her cell for the purpose of collecting a store of food or materials, glide into it and leave an egg—the germ of a future assassin of the larva that is to spring from that deposited by its side.

FLEAS.

A LADY of undoubted good taste observed once, she was fond of fleas they were such lively little creatures. We are not very apt to desire an intimate acquaintance with their history

and habits, yet it nevertheless is interesting to observe some of their peculiarities. They breed and undergo their metamorphosis in a manner not unlike the silk-worm. A number of eggs being collected from a dog, and put into a pill-box, in a few days produced hairy caterpillars, which were fed with dead flies, and which the caterpillars ate with voracity. It was observed occasionally, that they cast their skins; and in about ten days after their exclusion from the egg, they spun and wove themselves little cases after the manner of silkworms, in which they remained enclosed in the chrysalis state about nine days and then came forth perfect fleas, armed with sufficient powers to disturb the rest or even the peace of an emperor.

The muscular power of the flea is almost beyond belief, Latreille mentions a circumstanee of a flea of moderate size dragging a silver cannon mounted on wheels, that was twenty-four times its own weight; and which on being charged with powder was fired without at all alarming the flea. Socrates appears to have measured the leap of a flea, and found it extended to two hundred and fifty times its own length, an astonishing distance, indeed, as if a man of ordinary stature should be able at one vault to clear a distance of a quarter of a mile.

FISH.

Fish will sometimes make their appearance in ponds which have no communication with other streams, and it would seem difficult to account for the manner in which they have originated in their new habitation. A writer in the *Edinburg Philosophical Journal* states a fact which throws much light on this subject. The large water-beetle which is in the habit of feeding upon the spawn of fish, occasionally in the evening climbs up the stems of rushes, &c. out of the water, sufficiently high to enable it to take wing; in these circumstances it has been caught, and putting it into water, it had been found to give out the spawn with which it has gorged itself previous to taking flight, both in a digested and undigested state, so that on trial it has been found that it produced fish of various kinds.

COCHINEAL INSECTS.

Cochineal insects, have been introduced into Spain from S. America and they are said to thrive well in the neighbourhood of Cadiz. From Cadiz a quantity of them were lately carried to Malta by Dr. Gorham, on account of the British government and it is said

they are likely to do well in that Island. The plant on which they are said to subsist, is the prickly pear, *cactus opuntia*, a very common native of our country, growing every where in the United States, and which has for some time past become completely naturalized in the South of Europe and abounds all along the mediterranean coast. The experiment, we believe, has never been tried in our country of feeding them on this plant, but it would undoubtedly succeed if it has been found to answer with this valuable insect in the South of Europe.

USEFUL ARTS.

WATER-WHEELS.

THE most extensive, and by far the most economical moving power for machinery in this country is water; this is applied upon wheels of different construction, according to the peculiar situation of the ground and water-fall to be used, the kind of machinery to be operated, and the judgment or fancy of the proprietor or his mill-wright. Of the great variety of water-wheels used in this country, we shall, at present, confine ourselves to a description and estimate of the relative value or force of three kinds; namely, the Overshot, the Breast, and the Undershot wheels; premising that we, as well as the public, are indebted principally to the Engineer, Mr. Smeaton, for the facts which we are enabled to state, and which he obtained by means of extensive and laborious experiments upon the subject of water-power.

As an over-shot wheel is propelled by the *weight* of the water which is let on it, without any calculation of impetus, it would seem, in theory, that it would raise a weight precisely equal to that of the water thus let on, the same height as that through which the water fell, the arms of the wheel being considered as a lever, upon one end of which was the water, and upon the other the weight to be raised. But Mr. Smeaton found by actual experiment, that this did not hold good in practice, and that 100lbs. of water poured upon an over-shot wheel would only raise a weight of 66 2-3lbs. from the point where the water left the wheel, to that where it entred upon it, or the same distance through which the water fell; one third of the power being lost by friction, leakage, &c. In his numerous experiments, he also found that the greatest

effect was produced by the water, when it entered upon the top of the wheel, and descended with it to the bottom. It is the common practice with mill-wrights to conduct the water over the top of the wheel, and allow it to enter the buckets on the opposite side; but when this is done, there is a considerable loss of power by means of the water being thrown out of the buckets by the centrifugal force which it acquires. The better way is, and it is now practised by the best engineers, to construct a floom projecting over the wheel, in the bottom of which is an aperture, through which the water gushes in a reverted direction, and nearly at right angles with the arms of the wheel. The water is prevented from making its escape, by means of a sweep which is constructed round the wheel, and which gives it the principal advantage of a breast wheel.

The effective power of water striking against the buckets, being only one half of that produced by its gravity, after it has entered upon them, falling through the same space, it is advisable to give it no greater descent from the pond or reservoir to the wheel, than shall be sufficient to create a velocity equal to that of the periphery of the wheel; this, however, is highly necessary, as otherwise a part of the force of the wheel would be expended in overcoming the inertia of the water.

It is stated by Mr. Banks, that to produce the greatest effect, the wheel should bear such a proportion to the height of the fall, that the water may be let upon it an angle of about 45 degress, or at right angles with the arms of the wheel. Upon this rule, Allen in his "Mechanics," gives the following table for the diameter of wheels adapted to any fall from 6 feet to 20.

Fall of water.	Diameter of the wheel,
6 feet,	6 feet 1 inch.
7 "	7 " 3 "
8 "	8 " 5 "
9 "	9 " 7 "
10 "	10 " 8 "
11 "	12 " 0 "
12 "	13 " 2 "
13 "	14 " 4 "
14 "	15 " 6 "
15 "	16 " 8 "
16 "	17 "10 "
17 "	19 " 1 "
18 "	20 " 3 "
19 "	21 " 6 "
20 "	22 " 9 "

With regard to the velocity of water wheels, it seems to be agreed by the best engineers, that the velocity of the rim should not exceed four or five feet per second, and Mr. Smeaton states, that he uniformly found the greatest effect to be produced when the velocity was only three feet per second.

Breast wheels are constructed like undershot wheels, with float boards instead of buckets, but they differ from them in the manner of receiving the water, which is applied near the level of its axis. This wheel is propelled not only by the impetus of the water striking against the floats, like an undershot wheel, but also by its weight, it being kept on the floats by a sweep or breast, built round that part of the wheel from where the water enters upon it, to where it leaves. This kind of wheel is inferior in effect to an over-shot wheel, but superior to an under-shot one: it is used where the fall is insufficient to allow the water to enter the buckets, and produce effect in the time that it would be in passing through the descent. It should be used where the fall is over four, and not exceeding ten feet.

The *under-shot wheel*, is more simple in its construction than any other kind: it is acted upon merely by the impetus of the water, which is found to produce only half the effect of its own weight, falling through the same distance; and hence, with a given fall it requires *double* the water to carry an under-shot wheel, that it does an over-shot one; it should, therefore, never be used except where the fall is too small to use either an over-shot or breast wheel. Allen states that this kind of wheel performs the greatest quantity of work, or produces its maximum effect, when its circumference moves with about three sevenths of the velocity of the stream that drives it. Smeaton found its power was to its effect, only as 2 to 1, whereas that of the over-shot wheel is as 3 to 2.

The terms *Head* and *Fall*, are frequently used in reference to water, wheels, &c.: by the first, is meant the distance from the surface of the water in the pond or floom, to where it enters upon the wheel. The *Fall* is the descent of the water from this point to the bottom of the wheel.

SMOKY CHIMNIES.

He that can keep his body warm, and his temper cool, in a smoky room, in a cold, stormy, winter's day, has less of poor human nature in his composition than most men. Of all the evils "that flesh is heir to," deliver us from a smoky house, and its concomitants, a scolding wife, and ill natured, peevish, squalling children.

Some chimnies draw well except when the wind comes from a particular quarter; but the moment it veers round, and gets into that quarter, down it comes, puff after puff, and the whole house is immediately filled with smoke: from this there is no possibility of escaping unless one flees to the street and encounters the pelting storm, or, which is still worse, resorts to the neighbouring tavern, and there, like Tam O'Shanter, plants himself "fast by the ingle, bleezing finely."

These kind of chimnies can be remedied by the following apparatus. Over the top of the chimney fix an upright iron pipe like that of a stove-pipe, only larger, so that it will turn easily; to the top of this, and at right angles with it, attach another open at both ends, and having a communication between the two; inside of this last must be inserted a trumpet shaped tube, the large end of which must just fit, and be fastened to the pipe, in which it is inserted, and the small end extended over and beyond the mouth of the first, or perpendicular pipe, but not quite to the end of the one in which it is inserted. It must be remarked, that the top, or horizontal pipe should be so attached to the perpendicular one, as to have what we may call the escape end, extend from it considerably farther than the mouth end. To complete the apparatus, attach a piece of sheet-iron to the escape end of the horizontal pipe, large enough to cause the whole to traverse like a vane, by which means the mouth will always be presented to the wind, and a current passing through the trumpet-shaped tube, over and beyond the flew of the chimney, which will produce a draught, and carry off the smoke. With this apparatus, provided it traverses well, it is impossible that a current of air can ever get into, and pass down the chimney, while a current proportioned to the strength of the wind, will always be passing over the top of the chimney, and forcing the smoke off as it rises.

AN EXCELLENT WHITE FOR WATER-PAINTING.

Dissolve four ounces of Roman alum in as small a quantity of hot water as is barely sufficient, and then mix it with two ounces and a half of honey. Let this mixture evaporate to dryness in an earthen vessel, over a gentle fire. It will then appear like a spongy sort of coal, which being removed from the fire, must be pounded, and the powder placed in shallow crucibles, so that it may lie very thinly on them. Expose these to a strong *red heat* for an hour. After this the powder must be pounded again, and being replaced in the crucibles, it must be exsosed anew to a strong red heat, and

to a free current of air for an hour longer. Being then removed from the fire, it is to be reduced upon a porphyry to an exceedingly fine powder, and will be of an intense whiteness. It may be mixed with gum water, in the same manner as other paints are usually mixed, and is not apt to turn to a dusty hue like white lead.

Lond. Mech. Mag.

DYEING SILK A PERMANENT CHROME YELLOW.

Cleanse the silk at one heating of two hours, wash and wring it; plunge the skeins in a solution more or less strong of sub-acetate of lead, according to the desired depth of yellow. At the end of two hours take them out, expose them to the air for half an hour, then wash them in a stream and wring them. Prepare a bath, in which a sufficient quantity of neutral chromate of potash (about from the fifteenth to the twenty-eighth part of the weight of silk) is dissolved. Neutralize the bath with half a glassful of hydrocloric (muriatic) acid. Leave in it, during half an hour, at the mean temperature, your silks: twist or wring them over the liquor, and wash them in a slight solution of soap, just warm, then in a stream of cold water.

The shades of yellow are varied by altering the quantities of the mordant of sub-acetate of lead, and of the chromate of potash, which must always be neutralized by hydocloric acid.

[*Recueil Industr.*]

Composition of concentrated Cologne Water, for which a patent has been granted (in France) to Mad'e. Crozet.

Essence of Portugal,	12	parts	by weight.
" Bergamotte,	12	"	"
" Citron,	8	"	"
" Lemon-peel,	8	"	"
" Orange-flowers,	12	"	"
" *Petit-grain*	8	"	"
" Rosemary,	16	"	"
" Lavender,	16	"	"
" Bensoin	16	"	"

Infuse the whole in 1, 8 pint of well rectified spirits of wine for fifteen days, carefully shaking the mixture well four times a day. Afterwards distil it at twice, and the result will be 1, 8 pint of concentrated Cologne-water, which may be made at pleasure, Cologne-water of the first quality, highly perfumed, by adding ten times its

volume of spirit of wine, or rather very good common Cologne-water, or by adding twenty times its volume of spirit.

The concentrated Cologne-water offers the advantage of occupying little room, and thereby diminishing the trouble and expense of carriage of common Cologne-water.—*Descript. des Breve.*

METHOD OF BRONZING PLAISTER FIGURES.

With a quantity of isinglass make a size by dissolving it in warm water. With this liquid wash the figure till it ceases to absorb it; then go over it with a brush for the purpose of removing, while soft, any of the size that may remain upon the surface. When the figure is dry, it is to be washed very slightly with very thin gold size. Set the figure aside to dry, taking care that no smoke or dust shall approach it. In one or two days the bronze powder may be put on, which must be done by dipping a lock of wool or cotton into it and dusting it on: after this is done the figure is to stand another day, when the loose powder must be removed with a soft dry brush. A figure thus prepared will have the appearance of metal, and resist the rust.

To make bronze powder, dissolve a quantity of copper filings in nitric acid, (aquafortis,) when the acid is thoroughly impregnated with the copper, the solution must be poured upon iron, when a powder will be precipitated: wash this powder several times over in clear water, and when dry it will be ready for use.

SAFETY-PUMP.

To the Editors of the Magazine of Useful and Entertaining Knowledge.

GENTLEMEN,

It affords me pleasure, in fulfilment of my promise, to send you the accompanying contribution to your valuable Magazine. Some EXTRACTS *from my* "Paper submitted to the New-York Literary and Philosophical Society" *have already been published, in the New-York Courier & Enquirer of August 26th, 1830; and these Extracts have been reprinted in many other periodicals. I beg leave now, to submit to you the entire document, together with a very interesting communication, addressed to me by Dr. David M. Reese.*

With my best wishes for the success of your useful work,

I am, Gentlemen, yours very respectfully,

November 8th, 1830. J. F. SCHROEDER.

SAFETY-PUMP,

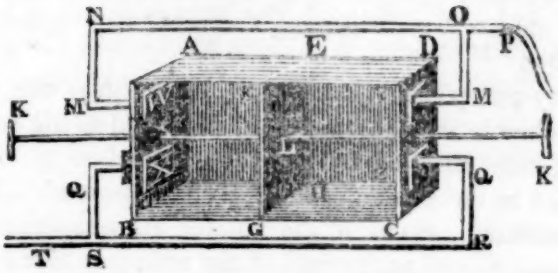
For detecting and removing the noxious gas found in wells, cisterns, and reservoirs; a paper submitted to the NEW-YORK LITERARY AND PHILOSOPHICAL SOCIETY, Sept. 9*th*, 1930. *By* JOHN FREDERICK SCHROEDER, *a member of the Society.*

Gentlemen, Members of the Literary and Philosophical Society.

I now beg leave to invite your notice to the machine placed before you. Its object is to SAVE LIFE. During the past year, our public papers have again and again directed our attention to the fate of a number of our fellow creatures, who have been hurried into an untimely grave, by the malignant influence of noxious air in wells. Descending without due precaution into such wells as have contained deadly gases, the unfortunate sufferers have thus been deprived of vital aliment, and have immediately perished. Even when the melancholy cause of the catastrophe has been discovered by the aflictive fate of one, there have been others, who could still boldly venture into the same reservoir of death. They have been unable to remove the deadly gas; yet they have wished, that the dead body of their companion might be obtained, and be interred according to the usual rites of Christian burial. Sometimes affection has induced a near relative or friend, to seek to rescue from their melancholy situation the remains of one beloved; and sometimes an inconsiderate precipitation, a presumptuous rashness, has induced others, in the same cause, to make an unnecessary and unwarrantable risk of life. During the lapse of a few months, we have received accounts of many in the different sections of our civil union, who *by means of an apparatus, such as that now submitted to you* might have been saved. They might thus have readily discovered the destroyer of their lives; they might, in a few moments, have expelled him from his secret lurking places; and they might also have been rescued from the miserable fate by which they perished—perhaps, unprepared to die.

To secure others from a similar calamity, the SAFETY PUMP has been invented; and with this design it is now respectfully submitted to your consideration.

The construction of the SAFETY PUMP will be best understood by the drawing and the brief description, which I here give



A. B. C. D. is a box of wood, two feet long, one foot wide, and one foot deep. E. F. G. H. is a midriff, to be moved through the box, from end to end, by means of the rod K. K., which passes through the middle of the ends of the box, and is firmly attached to the midriff at I.

Each end of the box has two apertures, seven inches by four inches; each aperture has a valve; the two upper valves open inward; the two lower valves open outward; the valves opening outward move in tin boxes.

M. N. O. P. is the *inhaling-pipe*, which communicates, by means of a conduit, with the bottom of the well, the conduit being fastened to the pipe at P.

Q. Q. R. S. T. is the *exhaling-pipe*.

When the midriff is moved from A. B. to D. C. two cubic feet of noxious air may be inhaled from the well, and will pass into the pump through the valve W. and when the midriff is moved back to A. B. the same air is exhaled through the valve X. and passes out of the exhaling pipe at T. This is true, in regard to the opposite end of the box; so that the operation of the pump is twofold.

The midriff may readily be moved through the box a hundred and twenty times in a minute; and the pump, which may be worked with great ease, if properly made, requires the labour of only two men or boys.

The following are results of the practical application of the machine. A new well, four feet in diameter, in the rear of Union Church, at the north east corner of Orange and Prince streets in this city, was infected with a most deadly gas. On Friday, July 16th, a man, attempting to descend into it, was instantaneously deprived of life; and a few moments afterward another shared the same miserable fate, in an attempt to rescue his unfortunate companion. On the following Tuesday morning, in company with some friends, I visited the melancholy scene of the calamity. We found the well, by actual measurement, to be thirty-one feet deep. On lowering a lighted candle into it, the flame, when it was six feet

only, from the surface of the earth was suddenly extinguished. Impure air, we inferred, must occupy the remaining space of twenty-five feet below.

The Safety-pump was placed on a bench, near the well; a tin conduit, attached to the inhaling pipe, extended to the bottom of the well, and another conduit, ten feet long, attached to the exhaling pipe, extended to an adjoining vacant lot of ground. The Safety Pump was worked. Some of the vitiated air was then obtained in a glass receiver, placed at the end of the exhaling pipe; and by the application of the usual chemical tests, this vitiated air was proved to be CARBONIC ACID GAS, or what is commonly termed choke damp.

When the Safety-pump had been in operation for the space of seven minutes, a lighted candle was again let down, and the flame was not extinguished until it had descended nearly twelve feet farther than before. The pump was worked again for ten minutes, and a candle being then let down to the very bottom of the well, burned there with a clear flame. *In seventeen minutes all the deadly gas was entirely expelled.*

This experiment was made before a company of gentlemen, one of whom, Doctor Stephen B. Whiting, after the above operation of the Safety-pump, went to the bottom of the well and remained there for a time, without sustaining any injury, or any inconvenience.

Another well, in the premises of Mr. Edward Brennau, No. 11, James street, was infected with foul air. On Saturday, Aug. 28th, I loaned to Mr. Brennau my Safety-pump, and was present during its operation. The well, six feet in diameter, is seventeen feet and six inches in depth; and at the time of the operation, it contained two feet and six inches of water. The foul air extended upwards, from the surface of the water eleven feet and a half; for a candle, let down into the well, was instantly extinguished, when three feet only from the surface of the ground. On working the Safety-pump *nine minutes*, all the foul air was expelled, and a candle let down, burned with a clear flame at the water's edge.

The well thus freed from deadly gas, was thoroughly cleansed by two labourers employed for the purpose, who sustained no injury whatever, while in the performance of their work.

There are various important purposes to which the Safety-pump admits of being extensively and usefully applied. At some future meeting, I shall beg leave to call your notice to a few of these. My only object at the present time, is to introduce the subject, in the hope that it may secure your kind indulgence, if not your full approbation. Whatever may be your voice, gentlemen, I shall enjoy the pleasing sentiment, that my aim has been TO SAVE THE LIVES OF MEN, and to afford at least to some of my fellow-mortals, increased opportunities to prepare for their eternal state.

Letter from DAVID M. REESE, *M. D. to the Rev.* J. F. SCHROEDER, *containing an interesting account of resuscitation, after a patient who had been immersed in carbonic acid gas, for the space of half an hour.*

New-York, November 4th. 1830.

REV. J. F. SCHROEDER,

Dear Sir,

Your philanthropic and successful endeavours to PRESERVE HUMAN LIFE FROM THE EFFECTS OF THE CARBONIC ACID GAS, so often fatal when found in wells, brewers' vats, &c. together with my own personal knowledge of the interest you feel, in every philosophical subject connected with THE RELIEF OF HUMAN SUFFERING, have induced me to communicate to you the following circumstances, and place the facts at your disposal.

On Friday last, 29th October, about midnight, I was suddenly called to the Brewery of MR. WRIGHT, No. 56 Crosby Street; where I found, that a man about 40 years of age had fallen into one of the large vats, in a rash attempt to descend by a ladder, after three several times a light had been extinguished, which ought to have deterred him from such criminal imprudence.

When I arrived, they had not yet succeeded in getting him out of the vat, and as nearly as I could ascertain, he had been *half an hour lying at the bottom of the tub*, before the fixed air could be *bailed out by bags used for the purpose*. We very soon succeeded in removing him after I arrived, but he had been so long under the gas, that his condition seemed almost hopeless. His skin was cold, and discoloured to an almost mahogany hue; his muscles relaxed, to an extent I have seldom witnessed; and, but for a slight irregular action of the heart, I should have judged him quite dead.

Having hastily torn off his clothes, and his body being held in an erect position by two men, his head hanging so that his chin rested on his breast, I commenced the experiment at resuscitation, by *violently throwing a bucket of cold water against the spine*. This I repeated three several times, before there was any visible effect produced.

He then made convulsive attempts at respiration, which encouraged me to proceed. Continuing to apply cold affusions to the spnie, I was presently able to rouse him by this powerful shock, so that he began to groan very audibly, and his pulse at the wrist was now

quite perceptible. Believing that reaction might now be confidently expected I removed him from the spot now deluged with cold water, and wrapping him in blankets, I watched the pulse, and was encouraged by the efforts of the system to rally, which were quite as early manifested as I had expected. No sooner, however, had the circulation been re-established, as shown by the glow upon the skin, and the state of the pulse, when stertorious breathing of an alarming character, and other *apopletic symptoms*, distinctly warned me that the reaction would be too violent; and that unless I interposed sudden and extensive depletion, my patient would fall a victim to apoplexy of the brain or lungs. I instantly *divided the frontal branch of the temporal artery*; which bleeding profusely, I now had time to examine his condition minutely. The pupils were dilated, nearly to the whole extent of the cornea, and the eye ball itself so insensible that I passed my finger roughly on its surface without producing sensation. The noise of his breathing now increased, and he began to groan most hideously. After losing about two pounds of blood, the muscular relaxation was changed to a rigidity of universal extent, and convulsions followed, accompanied by shrieks and cries of a most appaling character. I suffered the artery still to bleed, and renewed the use of cold affusion, which quickly terminated the paroxysm, and although before, six of us were unable to hold him, in a few minutes he became calm, swallowed a cup of cold water, opened his eyes, and recognised the minister, who had arrived soon after the accident. The pupils having now become sensible, and the respiration regular, and finding the pulse had acknowledged the bleeding, I stopped the artery, and by frictions to the extremities terminated the treatment of one of the most appalling and interesting cases of resuscitation I ever witnessed.

The patient was now carried to bed, slept soundly, rose in the morning at day light, and walked down stairs. *He has since entirely recovered.* He has no recollection of any of the circumstances attending his restoration, and can remember nothing after falling from the ladder in descending the vat, until he found himself in bed the next morning, with his head bound up. He declares himself to have suffered no pain, or disagreeable sensation, although his groans and cries indicated extreme agony.

That this man was half an hour immersed in carbonic acid gas, and was afterward by any means restored to life, is of itself a fact of the utmost importance to be known and remembered. For it is equivalent to being under water for the same length of time, and many such have been left to perish without an effort of any kind. Had the same means been employed in the cases which occurred recently in our city, when two men were killed by descending into a well containing this same gas, it is highly probable they might have been preserved to their families and to society.

Had one of the SAFETY PUMPS, for which we are indebted to your ingenuity been in the brewery at the time of this accident, *the vat might have been emptied, in two or three minutes*, and I might have descended with safety and applied remedies which would have been *prompt and immediate*, while he remained in the vat. And by your pump, after an individual has incautiously entered such a well, it might be emptied, and the person removed in a few minutes. Even, however, if half an hour be employed in removing the body, this case affords proof, that by these simple means, in the power of any man to perform, sanguine hopes of restoration may be entertained. And in the case of drowned persons a similar course of treatment would resuscitate many, who are now killed by the ill judged humanity of those who roll them over barrels or hang them up by the heels.

As your pump for emptying wells of this gas is becoming known to the community and will probably attract extensive attention; allow me to to suggest that your humane designs might be still farther promoted, if you would accompany each of them with printed directions for the treatment of persons who are apparently dead, from being suffocated by the carbonic acid gas. I lay no claim to novelty or originality in my treatment of this case, but conceive its success in this instance, should commend it to future repetition, and therefore communicate the facts without farther remark.

M ost Respectfully
Your friend,
D. W. REESE, M. D.

[*We deem it proper to state, that Mr. Schroeder has taken no patent for the invention of his* SAFETY PUMP, *it being his benevolent wish that its benefits may be universally enjoyed.*]

COPAL VARNISH.

By J. J. Berzelius.

Copal reduced to coarse powder, and watered with caustic liquid ammonia, swells, and is converted into a gelatinous mass, which is entirely soluble in alcohol. To affect this solution, which makes a very beautiful varnish, liquid ammonia is to be added by degrees, to pulverized copal till the swelling ceases, and it becomes a clear and consistent mass. It is then heated to 359 cent. and introduced in small portions at a time to alcohol of 8, having a temperature of about 59 cent. shaking it well after each addition. A solution is thus obtained, which, after depositing an insignificant portion of sediment, is absolutely colourless and as clear as water.

Method of cleaning Gold Trinkets and of preserving Engraved Copper-plates.

Boil the trinkets in water of ammonia, which dissolves the metallic copper of the alloy to a certain depth, so that after the operation, the metal is, in fact, gilded, nothing but pure gold being visible. In this process the waste of gold, which takes place by the application of neutral salt to disengage nitric acid, (in the usual method of cleaning trinkets) is avoided. Hitherto chemists have neglected to observe that metalic copper is soluble in ammonia. Dr. M'Culloch has shown that the solution takes place rapidly at a heat sufficient to boil the water of ammonia. He says, copper-plates are apt to be injured by lying by, a coat of oxide forms on the surface, which is rubbed off by the hand of the workman on the first inking, when the plate is again used; and by the re-formation of the oxide and being again removed, the fine lines of the plate are soon injured and obliterated. To prevent this, he recommends the application of common spirit varnish to the surface, when the plate is laid by; it is easily applied, and can be removed by spirit of wine.—*Edin. Jour. of Science.*

AGRICULTURE.

THE NEW ENGLAND FARMER,

Contrasted with the Agriculturalist of Europe.

The following remarks, says the Boston Lyceum, of Mr. Otis, Mayor of Boston, at the late cattle show in Worcester, are not only applicable to the New England farmers, but to those of New York, and a number of other states in the Union.

"It is the first time I have had the good fortune, to attend one of these exhibitions at a distance from the metropolis, but I have ever felt inclination and curiosity to witness an assemblage of the yeomanry of my native state upon their appropriate ground, and especially in this spot, which I have always been accustomed to regard as the heart of Mssachusetts—It has ever seemed to me that the interest in the scene would be increased, when transferred to a purely agricultural theatre, in proportion to its remoteness from the aid of the contributions of individuals of other professions, who to the honour of their public spirit have applied their own wealth and efforts to establish the wealth of the nation by raising the scale of agricultural iudustry. My expectations have been fully realized, and my gratification is complete, in beholding this resort of real farmers from all parts ot this great county, forming a happy community, and bringing with them the credentials of the genuine nobility which nature has established, not indeed with Lions and with Unicorns blazoned on their escutcheons, but with flocks and with herds of living animals, which, if they had voices, would proclaim with gratitude, "our masters are lords of the soil."

"When I beheld, this morning, the imposing spectacle of the thousands arrayed upon the four sides of the neighbouring hill, with their attention engaged upon the exertions which "speed the plough," I could not but compare in my mind, their enviable situation with that of the immense number of cultivators in another part of the globe, who, forced from their homes, are perhaps at this moment drawn up in hollow squares, and fighting battles in the success of which they have no interest, to increase a domain in the possession of which they can have no share—And we cannot dwell too much or too often, however familiar the truth of the reflection may be, upon the contrast in the condition of the yeomanry of this coun-

try and of this portion of it, with that of the tillers of the soil in other parts of the world. Look first at the gigantic empire of Russia embracing half the world, and we find the great mass of the population are slaves attached to the glebe, and with it transferable like its other appendages—In Poland, sometimes the granary of Europe, this humiliation is aggravated by subjugation to a foreign master. In Germany, in Spain, in Italy, with different modifications and palliatives, the same degraded tenures and vassalage prevail. In France, these oppressions have been mitigated by the revolution and the number of small proprietors has been increased and their civil and political capacities enlarged—But the privileged orders are also restored, and with them distinctions and inequalities to which we are happily strangers. Pass over into England, the nurse of agriculture, the cherisher of all science, and the model of all arts, —amidst all the riches, and glory, and liberty of that favoured nation, we shall find nothing to excite a wish in the independent New England farmer to commute situations with the farmer of Old England—Even there the greater portion of the land is held under superior lords, and burdened with rents and taxes and tithes to the Clergy, and the intolerable charges, increasing pauperism—Many of their farmers are certainly opulent and highly respectable. But in all their associations and exhibitions, the merit and pretensions of the plain farmer are merged in the interest felt and homage paid to the rich and titled Proprietor,—and the honour and glory of the improvements in every agricultural department, are by a tacit consent, for the most part, ascribed to the patronage of the noble Duke or popular Grandee. Thus we may traverse the world over, and though in its different quarters we may find luxuriant soils, and salubrious climates, we shall find the earthquake, the hurricane or the pestilence—or in the absence of these, ignorance, vice, and political misrule. In one place a privation of liberty—in another incapacity to make use of its possession. So that go where you will, you may return with pride and pleasure to the bleak mountains, and blithe vallies of your own region, with a conviction that no race of cultivators upon this earth have more abundant cause for satisfaction with their lot than those of blest New England."

CIDER.

How does it happen, that with manifold advantages (and Pomona never showered them more plentifully than on our hills) for making good cider, so little of it is ever to be found in the cellars of New England? This question has been asked before—and the answer is obvious—want of care and skill. But very much is owing to the former: too many among us had rather swill down forty barrels of bad cider than be at the trouble of producing a single barrel of good.

1st. The apples are often in a bad condition. 2d. There is a want of cleanliness in making the cider. And 3rd. There is little or no pains taken after it is made, to refine and preserve it."

To remedy these defects it is requisite that the apples should be perfectly sound, but mellow; that great care should be taken in having every thing belonging to the cider mill clean, with a cleanly disposition in those about it, and lastly, the cider, well strained should be put into clean casks and conveyed to the cellar. As soon as the fermentation is so far completed that the foam ceases to rise, and while the cider yet sings to the ear, it should be *nicked*, (to use a technical phrase) i. e. stopped close in the cask before the fermentation is entirely over. The object of nicking is to prevent the escape of the fixed air, which gives the sparkling appearance & lively taste that always belong to good cider. It is likewise important to prevent an intercourse with the atmospheric air, which however cheering to the spirits of men, is apt to sour the disposition of cider. This is a point which deserves great attention. Cider, when properly managed, is in the condition of wine—in fact, it is a sort of moderate wine—and the object is to prevent it becoming vinegar. Too great care therefore, cannot be taken to keep the fixed air in, and the atmospheric air out.

It is common for those who wish to have fine cider, *to rack it off*, as the phrase is—i. e. draw it out of the original casks and put it into others, as soon as it has become clear, after the fermentation. The object is to remove it from the lees. But the advantage of this measure is perhaps questionable; for, in drawing off the cider, a good deal of the carbonic acid (fixed air) must necessarily escape, and thus far the liquor is injured. The point then is whether the cider will be injured more by standing on the lees, than by the loss of carbonic acid in changing casks,—and this perhaps can only be settled by experiment. But if it be racked off, it should be done as expeditiously as possible, so that little time may be allowed for the escape of the fixed air.

Cider may be kept good in a vessel of any size, as long as it remains unbroached. But as soon as you begin to draw the cider,

the outer air is getting in, and the fixed air is getting out—and this mischief is increasing every time you draw, until at length the liquor, before it is half used becomes *flat*, stale, and utterly unfit to drink. To remedy this evil entirely, the cider should be kept in vessels so small, that the contents of one of them may be used at the time of broaching.—Hence it is that bottled cider is superior to to that of the cask. But as bottles are concidered too expensive for general use, small casks might be substituted, and would be found much better than large ones because the cider would be sooner drawn out, and therefore not so long exposed to the air after broaching. We would therefore recommend particularly to small families, the use of 10 or 15 gallon casks, in preference to barrels or hogsheads.

Many people have an idea that cider may be improved by mixing with it some foregin substance—such as rum, brandy, &c. Hence they will take much pains, and pay an extra price to get a cask to put their cider in. But this notion is erroneous. Cider, instead of being improved, is decidedly injured by a mixture with rum, brandy, or any other spirituous liquors. Notwithstanding all the praise bestowed upon it, we have never drank a glass of good cider from a cask previously imbued with rum. It is a rummy taste, which destroys the fine flavour of genuine cider. The object should be to get pure cider—not cider and rum.

Some persons put beets into their cider, others a slice or two of raw beef, under the idea that the liquor wants something to feed upon. What nonsense! It is not a tincture of beets, or of beef, that we wish for; but pure unadulterated cider—And all foreign substances, whether solid, liquid or æriform, should be carefully excluded—and then you may put the cup to your lips, with the certainty of gratifying your palate, exhilirating your spirits and promoting your health.

Northern (R. I.) Star.

BUTTER.

What is more delicious than good yellow, sweet, fresh butter; and what more disgusting and nauseous than that which is streaked, old and rancid? And yet how seldom do we meet with that which is made as it ought to be. The fact is, that very few dairy-women know how to make first rate butter, or if they do know how, they seldom put their skill into practice. The best butter that is found in the New-York market, comes from Orange County, and is known by

the name of the *Goshen butter*. He who travels among the farmers of this County, may visit the dairy of every house-wife in it, and scarcely meet with such a thing as a dirty churn, such a thing would disgrace the county and ruin the reputation their butter has justly obtained for excellence and cleanliness. The utensils used in the dairy, and the dairy itself, is kept in the most perfect order, being scalded and scrubed immediately after being used, and the milk rooms are well aired and kept free from every thing offensive. The manner in which they make their butter is the following; "The milk is carefully strained, and as soon as the cream is completely formed, it is, together with the cream, emptied into the churn, when the churning is commenced and continued, with short intervals, till the butter is come. The butter is then taken out with a wooden ladle and put into a large wooden bowl where it is worked with the same ladle, till it is entirely freed of the buttermilk. In this manner, not only the best butter, but also the best buttermilk is obtained; which, besides affording an excellent beverage, makes with the addition of a little sugar, and a rusk or some good bread, a dish to crown the farmers dinner, more refreshing and delicious than the most costly viands that grace the tables of pampered epicures."

If cream be kept for any length of time before it is churned, and this is almost invariably the case, it acquires a rancidity that will, in spite of all that can be done to it afterwards, affect the butter made from it: it should never stand more than twenty-four hours, and it makes finer butter to churn it within twelve hours.

A great many recipes have been given as to the manner of preserving it, but the best method we know of is, to take one part of Loaf sugar, one part of refined Salt peter, and two parts of pure salt, pulverize them well and mix them together; then, to every pound of butter which has been *thoroughly cleansed of buttermilk*, add one ounce of this mixture which must be well incorporated with it. When this is done, put the butter into a clean and tight vessel or vessels, and cover it in such a manner as to wholly exclude the air from it, then set it away in a cool place, and it will keep sweet for a long time, Johnson, in his animal chemistry says, for many years, we will only say, for many *months*.

PICKLE FOR BEEF AND PORK.

The following is what is called the Pocock Pickle for curing meat, and is considered by those who have followed its directions as much superior to any other method; we venture to say that those who will make trial of it in packing down their meat, will acknow-

ledge that the high eulogeums which it has received are justly merited.

"Take of water, four gallons, the best kind of salt six pounds, salt peter, two ounces, sugar, (or molasses) one and a half pounds; boil these together, and skim off the scum that may rise to the top; then sit it away to cool. The meat being placed in the vessel intended to hold it, pour the cold pickle on it till it is covered. If the meat is to be preserved for a considerable time, the pickle must be boiled and skimed once in two months, throwing in while boiling, two ounces of sugar and half a pound of salt. This pickle is incomparable for curing hams, tongues and hung-beef. When tongues, and hung beef are taken out of the pickle, they should be cleansed and hung up in a dry warm place. Those who prefer their meat salter than these proportions will make it, can add eight or nine pounds of salt instead of six. In hot weather, it is necessary, before the meat is put into the pickle, to rub it well over with salt, and let it be two or three hours for the juices to run off.

Another Pickle for corned beef. To six pounds of salt, two pounds brown sugar, and two ounces salt petre, add six gallons of water; boil the whole till transparent, and when cold put it upon the meat which must have been sprinkled with salt a day or two previous.

SCHOOLS, SOCIETIES, &C.

INFANT SCHOOLS.

Among the innumerable plans which have been adopted for meliorating the condition of man, for enlarging his mental faculties, increasing his endowments, and extending the boundaries of knowledge, not the least important is the modern instittution of Infant Schools. Though it is but a short time since these schools were first introduced into this country, they have already extended themselves into almost every city and large town in the United States, and we are happy to learn that they are making rapid progress in the interior towns and villlages of this and other states.

This institution is, in our opinion, destined to exert a most salutary and important influence upon the future character of society, by implanting virtuous principles in the tender soil of infancy, and by early cultivating in the minds of those who are hereafter to take the place of those who now act their parts on the busy stage of life, a taste for knowledge, and a love of science.

The idea of improving the minds of *children*, of giving them a

relish for learning before they could in fact speak plainly their mother tongue, was at first, and may still be by many who have not had an opportunity of witnessing the progress the little urchins are capable of making, considered altogether Utopian; but experience has shown that children of from three to five years of age, may acquire a knowledge of Numbers, of Geography, Astronomy, Natural Philosophy, Natural History, &c., altogether astonishing, and far exceeding that possessed by many "children of larger growth." Wherever these schools have been established, those who have witnessed the progress which their little inmates have made in the various branches in which they are taught—the cheerfulness, contentment, and innocent hilarity which reigns throughout, and which is perhaps the most prominent feature of the institution, have yielded up their incredulity, and become the warmest admirers and advocates of the system.

The main object of these schools are, first, the cultivation of good dispositions, and the prevention of the growth of vicious propensities; secondly, the improvement of the mental faculties; and thirdly, the promotion of the health and happiness of the children. To accomplish the first, discipline is indispensable, but no other is necessary than that which a kind, affectionate, and judicious mother would exercise over her children in a similar case: firmness, mixed with gentleness of manner—reproof, administered more with the tone of sorrow, than in anger, will generally suffice to render the little culprits humble and contrite.

The improvement of the mental faculties of the children is accomplished by methods not only consistent with, but promotive of their health and happiness; play, rest, and instruction, are judiciously alternated, and a constant excitement kept up, so as to prevent either their bodies from becoming fatigued, or their minds listless and weary. The lessons and instructions given are adapted to the capacity and circumstances of childhood, conveyed in a familiar conversational style, and made plain, intelligible, and interesting, not only by the manner of the teacher, but by visible objects, representations, and pictures. Strict care is taken not to burden their memories with dry, uninteresting facts, or with any thing that their minds cannot comprehend; the amount of information, however, in regard to the kingdom of nature in her various departments, which these "men and women in minature" are able to collect and deposite in their little store-houses of memory, is truely surprising; indeed we have heard them give correct replies to questions in Natural History, Geography, &c. which we venture to say, would have puzzled one half of the adults present, to have answered with readiness.

One of the most interesting features of these institutions is the perfect contentment, and cheerfulness of the children. Their lessons being short and considered rather a part of their amusements, than a task, they are under little restraint, but are suffered to rove about in search of pleasure, indulging curiosity, and exercising their limbs, as free as the bee that roves from flower to flower, and apparently as contented and happy.

These schools were first instituted for the benevolent purpose of relieving those mothers whose circumstances compelled them to devote their whole time to providing necessaries, and consequently to neglect the care of their children; in this respect they are the mother's best friend and assistant, relieving her of the care and trouble of her small children, and doing even more for them than she could possibly do,—cultivating their minds, and preserving them from the contaminating influence of vicious examples. It was found however, upon experiment, that other objects could be blended with the original design, and though that is still not less beneficial, yet in most of the schools, this is merely a secondary object, if it is taken into consideration at all; the principal motive that parents in general have in sending their children to these schools is the fact, that they will learn there much more rapidly than they can possibly be made to while at home, and by themselves.

But there is another advantage attending these schools, which should by no means be overlooked; and that is the circumstance of their being removed from those who, for the purpose of controling, frighten them with all manner of ghosts, hobgoblins, witches, and a thousand other monstrosities, which never existed but in the twilight brains of the ignorant and superstitious; the effects of which are felt to the latest hour of the existence of those who have in their infancy and youth been thus made to tremble at incorporeal and imaginary beings. Instead of being made cowards by these frightful stories, those who attend infant schools, are amused with anecdotes of real life, historical, biographical, &c. anecdotes that convey instruction as well as amusement—that teach the child to revere an Almighty architect, and to contemplate, admire, and study his works—in short, to investigate, and to *think*.

REPORT

Of the Third Annual Fair of the American Institute.

Published by Request.

THE Executive Committee, to whom has been entrusted the superintendence of the Third Annual Fair of the American Institute, respectlully report:

That they have devoted their best exertions to the duties of the station to which the Institute has been pleased to appoint them. In the performance of those duties, it has been their endeavour to give such direction to the transactions connected with the occasion, as were calculated to forward the objects expressed in the charter, viz. the encouragement of domestic industry *in this state and the United States*, "in agriculture, commerce, manufactures, and the arts." And they feel gratified that they are enabled to state, that their most sanguine anticipations have been amply realized.

The unfavourable state of the weather, it is true, caused a delay in the opening of the Fair, and prevented vast numbers from attending, incommoded those who did attend, and protracted the period of the exhibition beyond its proposed limits. Still when an interval of sunshine occurred, the spacious room was immediately filled to overflowing; and thousands, after in vain attempting to penetrate the crowd, were compelled to retire ungratified. Indeed, there was no period while the storm raged with its greatest violence, when new visitors were not constantly arriving. The torrents of rain did not discourage the ardour of curiosity, and the splendour of the scene was in all mouths. The number of spectators has been differently computed from 30 to 50,000.

But mere numbers are of minor consideration; the character of those who attended and gave their countenance to the exhibition, added peculiar interest to the scene, and afforded a just foundation of pride to those who had originated, nurtured, and sustained the Institution. Among these distinguished characters were the chief magistrates of neighbouring states, members of congress from this and other states, one judge of the supreme court of the United States, and the chancellor, judges, and magistrates of our city, with other eminent citizens and friends of the American System, from this and various states in the union. No one relished this practical proof of the march of improvement with more gratification than

that ardent, faithful and persevering friend of the American System, Hezekiah Niles, Esq. who attended the Fair by special invitation.

Our sincere acknowledgments should not be withheld from the ladies, whether we regard them as contributors or visitors. The devices of their minds, and the delicate productions of their fingers, in their various appropriate departments, swelled the diversity and heightened the pleasure of those who came to look and enjoy. But their propriety of demeanor, their elegance of dress and personal charms, caused many to forget that they came to witness the progress and perfection of domestic manufactures. It was not a transient display of taste and beauty; their cheering presence was rarely withheld from the earliest to the latest hour of the exhibition. To their presence and influence may no doubt be ascribed, in a great measure, the perfect propriety and order which uniformly pervaded the great room, from the beginning until the close of the Fair.

It cannot be required of the Committee to give a minute description of all the articles that were displayed. To name one half would be tedious, and to do justice by a detailed account of the merits of any considerable portion, would swell this report to an unreasonable length. We shall merely make some passing remarks on such as particularly attracted our attention, in the order they happen to occur to us, refering at the same time to the subjoined list containing the subjects of premiums, awarded by disinterested judges, and the catalogue of speciments, taken from the books of entries, with the names of the fabricators, and the places where they may be purchased. In the catalogues of specimens, the present duty is placed opposite each article, which proves, with scarce at exception, that those fabrics made in the greatest abundance and perfection, are indebted for their success to liberal governmental protection. This was deemed useful, to show the practical benefits of protection, and also as a directory for the information of purchasers to enabled them at any future time to supply themselves. The directory was deemed important, both to the manufacturer and farmer inasmuch as its tendency would be to increase the demand for the fabrics of the one, and the raw material of the other, by pointing the consumer to the merchant from whom supplies may be obtained, and thereby advance the views aimed at by the framers

of our charter, by promoting agriculture, manufactures, and commerce.

One of the first objects of attention among the articles exhibited, was a lot of the finest *merino wool.* We were pleased to learn that the quality of this article is generally improving in our country, and that if the impediments injudiciously thrown in the way of our woollen manufacturers by excessive duties on the imported materials used in their fabrication, were removed, the increased demand for wool that must follow would stimulate our farmers sufficiently to induce them to raise our full supply of the middling, as well as the finer qualities.

The specimens of *woollen cloths* were not numerous, but in high perfection, particularly the two first premium pieces, of blue and black. They have not been outdone in this, or in any other country.

The ingrained carpeting and hearth rugs equal the best imported. The felting cloth for carpeting, &c. of which a few specimens were offered at the last Fair, has been greatly improved in texture and colours; and from the small amount of labour required in its production, and its consequent cheapness, promises to add much to our comfort and happiness.

Cotton prints in fineness, delicacy, and richness of colour, have greatly surpassed all former exhibitions; and other cotton goods have arrived nearly to perfection—such as cotton cambrics and cotton yarn, which was exhibited as high as number 105, manifesting the beneficial effects of increasing duties, and strengthening the policy of protecting home industry.

The *linen* specimens were few—they however manifested much ingenuity, but no evidence is afforded that this branch of industry is at all keeping pace with cottons. The protecting care of government was early bestowed on cottons, but withheld from linens. The production of the first has increased twenty-fold in twenty-five years, while the latter has made no perceptible advances, either in quantity or quality, within the last fifty years.

The sample of *iron and steel*, in bars and rolls, afford proof that this great essential of civilization and improvement will, in a few years, be entirely supplied from our own resources. The castings from iron were equal to any ever imported, and defy foreign competition. Mathematical instruments and edge-tools, of various de-

scriptions, complete in their finish, attracted the admiration of many who never before knew they were made in America. Lathes, locks, coffee mills, cards, fowling-pieces, &c. were scattered promiscuously on the tables.

The perfection of our *cabinet wares* evinces, that under the present liberal protection, we may defy the competition of the whole world.

In *cut glass*, buttons, scales, silver-plate, and Britannia wares; leather, saddiery, ladies' and gentlemen's hats, shoes, and boots, paper, &c. we fear no foreign rivals.

A splendid case of gold and silver spectacles, by Jared L. Moore, a member of the Institute, should not pass unnoticed. Mr. Gardiner's richly embossed silver tureens and stands, and other silver wares, were universally admired. Mr. Thompson's costly silver waiters are not less deserving of praise.

Two brilliant and tasteful musical clocks, equal to any thing ever shown in this country, occasionally delighted us with their sweet sounds. Another magnificent clock, made by Mr. Mott, exhibiting the operation of its highly finished machinery through a glass front, was placed in one of the corners of the room, which surpassed any thing we have ever seen. A drawing of it was immediately taken to be forwarded to England.

Pianos of the most exquisite workmanship constantly delighted the multitude with their melodious tones.

Mr. Kennedy's carved and gilt flower-piece displayed great skill and precision in the art of carving.

The elegant coach laces of Mr. Miller, manufactured in Newark, N. J. should not pass without commendation. Coach lace received early and ample protection, and we are abundantly supplied from our own workshops, 50 per cent. cheaper than the imported.

The painted floor cloths from Mr. Sands, of Brooklyn, were much admired, as well as those from Mr. Tice's factory, 152 Eldridge-street, which for solidity, finish, and durable painting, deserve great praise. He commenced the manufacture about fifteen years since. The same article which then brought twenty-two shillings the square yard, is now sold at fourteen shillings.

A box of fine hosiery, elegant white embroidery on crape, and beautiful specimens of sewing, vandykes, hearthrugs, &c. by young ladies of this city, and other places, and from pupils of public ins-

titutions, contributed to the variety. The Institute was also indebted to the industry and taste of the ladies for a number of fancy scrap tables, in imitation of Chinese, ornamented with numberless entertaining devices and prints.

Many articles not generally supposed to be made in this country, were mingled with other domestic productions. Among them were bottles of carmine, manufactured by Joseph Boston, of this city, the only manufacturer of carmine in America, highly recommended by competent judges. Individuals of every profession and occupation found something suited to their peculiar inclinations. An imitation magnified ear, and vertical sections of the head, made of wax, arrested the attention of the anatomist.

The wild oats of Florida, hemp from Ohio of an excellent quality, with inferior specimens from other states; implements of husbandry, such as ploughs, corn mills, washing machines, &c. afforded entertainment for the farmer. New designs of earthenware, pitchers, bowls, &c. from Jersey city evinced that this most necessary department had not been neglected.

Those who had interested themselves in the raising of silk, gathered around the baskets of cocoons, or examined the native Chinese mulberry, which a member of the Institute has lately introduced into our country, to give suitable sustenance to the little spinning insect that produces the glossy material which invests the delicate forms of our fair countrywomen. Goods from the same material, such as threads, handkerchiefs, ribbons, bands, &c. were tastefully arranged in another place, and evinced that even this delicate and difficult manufacture, heretofore chiefly purchased from other nations, at the annual sacrifice of millions, is rapidly yielding to domestic skill and ingenuity, and will soon, with suitable encouragement, constitute an important item among the most valuable productions of American labour.

The statuary, cuttings, and paintings, we cannot pass unnoticed. The busts of Thomas Jefferson, Col. Willet, and Mr. Emmett, were so accurate, and so true to the life, that they seemed almost to partake in the pleasures of the living visiters. They were taken by Mr. Browere—the first, a few months before his decease; and it is pronounced a perfect fac-simile of the venerated patriot, at 87 years of age. The kneeling beggar boy, taken by means of Mr.

Browere's peculiar process, is also a striking representation of youthful misery and despondency, as was evidenced by the continued crowds that were attracted to it. Sterne's Maria, by the younger Browere, as well as his cuttings representing a comic burlesque, from Knickerbocker's History of New-York, are indications of youthful talent, that merit encouragement.

Among the paintings, the Battle of Askalon, by a young artist, was pronounced a superior production of the pencil.—The painting of Ichabod Crane, pursued by the headless Horseman of the Sleepy Hollow, from Irving's Sketch-book, deserves high commendation, both for design and execution.—The paintings of the Aqueduct on the Erie Canal, Lake Coneyock, and Scenery in the Rocky Mountains, were continued objects of attraction. We ought not to omit noticing a very natural and well-finished landscape, by Mr. Ward, a young American artist: the sky is fine, and the water pellucid and well tinted.

The foregoing are a few of the articles which have occurred to the minds of the Committee, as worthy of being spoken of in their general report: many others, equally meritorious, no doubt, have escaped attention or recollection. Among 3000 specimens, the greater portion of which do honour to those who produced them, some, perhaps, may have been entirely overlooked by the Committee, and others not examined with the attention they deserved; but the genuine merits and effects of these contributions of genius, and skill, and industry, are acknowledged by all. They were all displayed in one room, occupying a space of about one hundred feet in length, and fifty in breadth. Six tables, extending nearly through the room, were laden with productions from every department of industry; the sides and ends of the hall were decorated with paintings and prints, and the diversified productions of the needle and the loom. We may truly say, that no former exhibition has equalled this: the improvements in woollens, cottons, and hardware, since the last year, were perceptible to the most cursory observer, and were estimated at from 15 to 20 per cent. In all the leading protected fabrics, it was acknowledged important improvements had been effected: the number and variety of the specimens were greatly increased. In one respect only, was the present fair inferior to the last—the number of moving machines, which last year enlivened and animated the scene, were this year wanting.

The committee have not been unmindful of the utility of household manufactures. Special premiums, to a considerable extent, have been awarded for specimens of female taste and skill, in order that the good effects of our Institute should be carried to the firesides of our fellow-citizens, an impulse communicated to real home industry, and the exertions and handy work of our fair countrywomen be particularly stimulated and promoted.

The ardour of emulation excited some little disaffection and animosity, after the declaration of the premiums, among the disappointed competitors; but the Committee believe there has been a more quiet submission to the award of the judges, than has been experienced on any former occasion. Such gentlemen as were believed to be respectable, competent, and disinterested, were selected; and if in any case they have done injustice, it was no doubt the result of error, and not of intention; and, with a few individual exceptions, the competitors themselves have approbated the rewards.

The Committee were early of the opinion, that so great an occasion ought not to pass without a public address, directed to the judgment and understanding of the community, with such moral suggestions as would naturally arise in the mind of a patriotic statesman. Mr. Burges, of Rhode Island, was invited to perform this duty. The Committee knew him to be a gentleman thoroughly versed in the science of political economy, and habitually mixing with a people signalized for their industry; they knew he was in the possession of all the important facts necessary to the undertaking. He had seen his native state, limited in extent, comparatively a barren soil, by well-directed energy surpass in wealth and individual independence, territories proverbial for their fertility, and doubling his own state in population and dimensions. We were not disappointed in Mr. Burges: his address conferred honour on himself and the Institute. It comprehended the history of productive industry; he contrasted ancient nations, engaged in acquiring precarious wealth by wars, bloodshed, plunder, and subjugation, with modern nations, occupied in promoting the arts, and enjoying the durable fruits of peaceful labour; he exposed the fallacy of the free trade system of foreign dependence, and unfolded with consummate ability the boundless resources of our republic. The satisfaction expressed by the numerous and intelligent audience convened on the occasion, must have been grateful to the orator: they listened with continued pleasure to those complex subjects, which he so clearly and powerfully elucidated.

The Committee cannot but contemplate the third annual fair of the Institute, and its relations and effects, with pride and pleasure.

To those who sought recreation and amusement, and looked no further, it afforded innocent gratification.

Those who can feel a patriotic pride in beholding the advance of their country in manufactures and the arts, and an increase of its self-sustaining resources adequate to their best hopes, realized more animating and exalted sensations.

The gay and fashionable were delighted; the middling classes —our city yeomanry, the steady supporters of order, law, and religion—enjoyed a rich feast.

The curiosity of the inventor and artist, found food to satisfy itself among the almost infinite variety that ingenuity and skill had brought into existence.

The emulating mechanic saw the choice productions of his workshop duly appreciated, and the evidence of their merit promulgated.

Those who had been persuaded that we are too young a people to enter the course in competition with the old world, were satisfied that, though comparatively in infancy, our vigour, enterprise, and genius, have already accomplished results which have cost other nations centuries, and will soon enable us to distance them in the race of glory.

To the exalted individuals, the patriotic chief magistrates and judges of our sister states, who had purposely attended, and to our distinguished citizens, *in* and *out* of office, who were present, countenancing and encouraging our exertions, the Committee tender their thanks. The praise of illustrious men has always been a most acceptable reward to enterprise; and their presence and countenance will always be a most effectual excitement to higher efforts, and still more beneficial undertakings.

The Committee, in conclusion, would beg leave to recommend, that before another annual Fair, some measures be taken to procure still more spacious accommodations. The crowded condition of the room prevented many from examining the articles, and at times it was impracticable to gain even an entrance. Our increasing productions will increase these inconveniencies. Hitherto the expenses of the Institute have been sustained by the contributions and exertions of a few. They recommend an appeal, not only to munificent individuals, but to the Legislature, to enable the Institute to provide suitable rooms, and also to bestow liberal rewards to meritorious competitors. A reasonable appropriation for that purpose, would benefit every part of the state, and every department of industry. Surely no appropriation can be more unobjectionable than one to be applied for the promotion of salutary emulation among those who are engaged in producing, in the highest perfection, those commodities which are not only conducive to our comfort, but necessary for our health and existence.

All which is respectfully submitted.

POLITICAL ECONOMY.

FREE TRADE,—NO. III.

In discussing the policy of protective laws, we would not be understood as taking part in the political contests of the day: with partisan politics we have nothing to do, and from them we shall keep aloof; the question whether protecting duties are proper or improper,—whether the encouragement of manufactures is beneficial or injurious to the country at large, is one of *national policy*, to be decided upon the broad principles of political economy. It is a question upon which men equally honest and equally able entertain different opinions: we confess we are among those who believe that the encouragement of domestic manufactures is essential to the prosperity of the nation; but we are willing to hear the arguments of those who think otherwise, and even to give them a place upon our pages, provided they are temperate, candid, and brief.

It is the first maxim of political economy, that labour is the only source of individual and national wealth. "It is to labour," says Mr. M'Culloch, "and labour only, that man owes every thing possessed of exchangeable value. Labour is the talisman that has raised him from the condition of the savage—that has changed the desert and forest into cultivated fields—that has covered the earth with cities and the ocean with ships—that has given us plenty, comfort, and elegance, instead of want, misery, and barbarism." Whatever, therefore, tends to increase the productive labour of any country, tends equally to increase the comforts, conveniences, and wealth of its inhabitants.

The thirst of gain, the desire of wealth, and the ambition natural to man, to appear as well as his neighbour, are the strongest incentives to activity and industry, and they are at all times, when they meet their proper reward, a sufficient stimulant to the industry of the country: it is only when that industry no longer meets its proper reward, that the exertions of enterprising men are paralyzed, and they become disheartened, indifferent, and idle: and this will always be the case where there is not a sufficient variety of avocations or branches of business in a country, to give profitable employment to all its inhabitants, or where the demand is supplied by foreigners.

In political economy as well as every thing else, *experience*, though often the most expensive, is certainly the most infallible teacher; and that individual or government that refuses to follow its dictates, and adopt its precepts, will ere long repent such folly, or rush blindly on to certain ruin. So far then as history, which has been, with equal elegance and aptness, styled "wisdom teaching by experience," sheds any light upon this subject, it shows us

most clearly and unequivocally, that no nation ever yet arrived at wealth, independence, and refinement by means of agriculture alone.

Among modern nations, none has arrived at a higher state of opulence than Great Britain, and none has carried the system of protecting the industry of its citizens against foreign competition, to a greater extent. The time once was, when this nation, now, or lately "the workshop of the world," received almost all the manufactured articles which she used, from other nations:—her cloths she received from Flanders, her silks from India, France, and Italy; her cottons also, from India, &c. She was then an *agricultural* nation, and her kings slept upon straw, and carpeted their presence chambers with rushes. But Edward III., a prince of equal sagacity and bravery, had the discernment to perceive the advantages that would result to the nation by the encouragement of domestic manufactures, and the wisdom to invite artisans from abroad, to settle in his dominions and carry on their business there; affording them protection against foreign competition, and allowing them "very great privileges and pensions, till they should be able to gain a comfortable livelihood by their ingenuity and industry."*

From this moment, the policy of fostering the infant manufactures of the country was perseveringly adhered to: the exportation of wool, and the importation of cloth was prohibited; and in the year 1463, under the reign of Edward IV. there were not less than sixty articles of manufacture, the importation of which was totally prohibited. Such was the origin of that collossal power, and immense wealth, which this little nation has in modern days wielded, and by means of which, she has been enabled to withstand, single handed, the combined efforts of nearly all the nations of continental Europe, headed by the most extraordinary man that ever lived, and finally, to triumph over her enemies on the ensanguined field of Waterloo!

This is one example of a nation, adopting and persevering in the policy of encouraging the industry of her own citizens, by protecting their products against foreign competition: we will now cite one which has pursued an opposite course.

In the year 1681, a person by the name of *Courteen*, established the manufacture of woollen cloths in Portugal, for which her citizens had before been dependent on Great Britain. This manufacture succeeded so well that three years after, a law was promulgated prohibiting the importation of all foreign cloths. Under the protection of this law, the Portuguese soon became expert in the manufacture of woollen cloths, and were able to supply both *Portugal*

* Mortimer's Elements of Commerce.

and *Brazil*, with their own fabrics, which were manufactured entirely from their own and Spanish wool.

"During twenty years prohibition," says the British Merchant, "the Portuguese succeeded so well in their woollen manufactures, that we brought from thence no gold or silver." This prohibition of foreign cloths, was of course, extremely obnoxious to the British merchants, who, through their government, made every possible exertion to obtain the repeal of the law, but their efforts were ineffectual so long as the Conde d' Ereicera, a patriotic nobleman, through whose influence the protective policy was adopted, lived: after the death of this able statesman, "in whom the nation," says Mr. Anderson, "lost her best counsellor," the British minister, Mr. Methuen, succeeded, (1703,) in obtaining the repeal of the obnoxious law, and the admission of British woollen manufactures; the consequence of which was the immediate ruin of all the Portuguese manufactures. "After the taking off of that prohibition, we," says the British Merchant, "brought away so much of their silver, as to leave them very little for their necessary occasions; and then we began to bring away their gold."

Mr. Methuen had the address to persuade the agriculturists of Portugal that the admission of their *Port wines* into Great Britain at two-thirds of the duty paid on those of France, was an ample equivalent for allowing the importation of her woollen goods—they calculated on securing a good market for their wines, and buying their cloths at reduced prices: never were a people more completely over-reached and deceived.

The effects of this treaty were such as every sound statesman would have predicted.—Their infant, but flourishing and profitable manufactures were ruined, the metallic currency of the country exported to pay for goods which they might just as well have continued to manufacture for themselves; Portugal became impoverished and dependent upon Great Britain, and has been ever since that time but little better than a colony of that sagacious nation. This is a memorable instance of the effect of the "Free Trade" system; of allowing foreign competition to destroy the manufactures of a country while yet in their infancy, and from this example we may judge what might be the effect of a similar measure in this country.

The capital invested in various manufactures in the United States, was estimated three years ago at $40,000,000; it cannotat present be less than $50,000,000. The capital invested in agriculture for the supply of the raw material for these manufactures, and for the support of those employed in them, is estimated at an equal amount: making in the whole a capital employed in this country in our manufactures, of

$100,000,000. Now if the present Tariff have the effect to protect manufactures, as we have gone upon the supposition of, (and if they do not, the advocates of free trade can certainly have no objection to them,) then their repeal would at once render this capital useless, and throw those to whom it gives employment, out of business: how then would the account stand?

Mr. Niles, than whom a more indefatigable, or a more accurate writer cannot be found in the United States, nor one who has devoted half the time to this subject, says in his excellent essay, entitled "Politics for Farmers," that there are consumed annually by the American people 22,000,000 barrels of flour, and 11,000,000 barrels of pork, or their equivalent.

It has also been estimated that one-twelfth of the population of the United States, or one million of persons, are engaged in manufacturing. If these estimates be at all correct, and we see no reason to doubt that they approximate the truth at least, it will follow that the consumption of flour by those engaged in manufacturing must amount to 1,830,000 barrels, and of beef and pork, 916,500 barrels or their equivalent. For the sake, however, of keeping within the bounds of probability, we will deduct one-third of this amouut, and estimate the flour at 1,220,000 barrels, and the beef and pork at 611,000 barrels; valuing the flour at $5 per barrel, and the beef and pork at $10 per barrel, which is certainly a very moderate estimate, the total value of the flour, and beef and pork, annually consumed by the manufacturing class, is $12,210,000; the whole amount of which is supplied by the farmers. By reference to the report of the Secretary of the Treasury made to Congress in December last, it appears that the total value of all the meat, (including *live hogs*) bread stuffs, (including *rice*) butter, cheese, lard, &c. exported from the United States during the year ending the 30th Sept. 1829, was $11,307,700; less by nearly a million of dollars, than the amount consumed by the manufacturers.

It appears then that more than one-half of the surplus produce of our farmers is disposed of in our *home* market, a market created and sustained by mechanics and manufacturers; now were this class of persons thrown out of employment by the free admission of foreign goods, what would become of all this immense amount of flour, pork, &c. that they now consume? Would they then purchase it? Certainly not, because they would not have the means of paying for it. Would those foreigners, whose cheap fabrics had driven our own

manufacturers out of employment purchase it? no; for we have already shown that their government, in order to *protect* their own farmers, prohibits them from doing so. What then would become of it? we answer; it must remain on hand as useless, dead property: this, to be sure, would not be exactly what our farmers would like, but then they would have the consolation of knowing that they could purchase such goods as they formerly exchanged their surplus produce for, extremely *cheap* of those foreigners, provided they could get the *cash* to pay for them.

But the evil would not end in the loss to the farmer of the market for that part of his surplus produce now consumed by the manufacturers; the manufacturers themselves, must turn farmers and swell the amount of produce, already greatly exceeding the demand; the consequence of which would be, the reduction of agricultural articles to the bare cost of transporting them to market.

Under this state of things it would be impossible for those whose business it is to till the earth, to procure those comforts, conveniences, and luxuries of life which they now enjoy in great abundance, and which they can readily purchase with the produce of their farms, instead of having the advantage of steam or water power and the various machinery which is now used in the manufacture of all kinds of cloth, and by means of which it can be afforded so cheap, they would again be driven to the necessity of making all their clothing in their families as was formerly the case.

Such, we answer, would, in our opinion, be the effect of a repeal of the Tariff—at least, in regard to those articles in the manufacture of which we are not yet able to compete with the British.

(To be continued.)

MISCELLANY.

FOOT OF A CHINESE FEMALE.

A PAPER was lately read before the Royal Society, containing an anatomical description of the foot of a Chinese female by Bransley B. Cooper, Esq.

The foot of which an account is here given, was obtained from

the dead body of a female found floating in the river at Canton, and had all the characters of deformity consequent upon the prevailing habit of early bandaging for the purpose of checking its natural growth. To an unpractised eye, it has more the appearance of a congenital malformation, than of being the effect of art, however long continued; and appears at first sight like a club foot, or an unreduced dislocation. From the heel to the great toe, the length of the foot measures only four inches; the great toe is bent abruptly backwards, and its extremity pointed directly upwards; while the phalanges of the other toes are doubled-in beneath the sole of the foot, having scarcely any breadth across the foot where it is naturally broadest. The heel, instead of projecting backwards, descends in a straight line from the bones of the leg, and imparts a singular appearance to the foot, as if it were kept in a state of permanent extension. From the doubling-in of the toes into the sole of the foot, the external edge of the foot is formed in a great measure by the extremities of the metatarsal bones; and a deep cleft or hollow, appears in the sole across its whole breadth. The author remarks, that from the diminutive size of the foot, the height of the instep, the deficiency of breadth, and the density of the cellular texture, all attempts to walk with so deformed a foot, must be extremely awkward; and that in order to preserve an equilibrium in an erect position, the body must necessarily be bent forward with a painful effort, and with a very considerable exertion of muscular power.

Phil. Mag.

BITTER AND SWEET.

Dr. Herschell has discovered, that the mixing of nitrate of silver with hypo-sulphate of soda, both very bitter substances, produces the sweetest substance known.

DEATH WATCHES.

These little creatures, whose portentous clink once made stout hearts quail, and still inflicts no small terror on many an ancient dame, even in these days of enlightenment, are described by Mr.

Carpenter. The singular noise which they make, proceeds from two distinct insects, one of these, the Anobium tessellatum, is coleopterous, of a dark colour, and about a quarter of an inch in length. It is chiefly in the latter end of spring it commences its noise, which may be considered analogous to the call of birds. This is caused by beating on hard substances, with the shield or fore-part of its head. The general number of successive distinct strokes is from seven to nine, or eleven. These are given in pretty quick succession, and are repeated at uncertain intervals. In old houses, where the insects are numerous, they may be heard, if the weather be warm, almost every hour in the day. In beating, the insect raises itself upon its hinder legs, and, with the body somewhat inclined, beats its head with great force and agility, against the place on which it stands. This insect, which is the real death-watch of the vulgar, must not be confounded with a minuter insect, not much unlike a louse, which makes a ticking noise like a watch; but instead of beating at intervals, it continues its noise for a considerable length of time without intermission. This latter insect, the Termes pulsatorium of *Lin.*, belongs to a very different tribe, (Neuroptera.) It is usually found in old wood, decayed furniture, museums, and old books. The female lays her eggs, which are exceedingly small, in dry dusty places, where they are likely to meet with least disturbance. They are generally hatched about the beginning of March. After leaving the eggs, the insects are so small as scarcely to be discerned without the aid of a glass. They remain in this larva state about two months, somewhat resembling in appearance the mites in cheese; after which they undergo their change into the perfect insect. They feed on dead flies and other insects; and often from their numbers and voracity, very much deface cabinets of natural history. They subsist on various other substances, and may often be observed carefully hunting for nutritious particles amongst the dust in which they are found, turning it over with their heads, and searching about somewhat in the manner of swine. Many live through the winter, buried in the dust to avoid the frost.

Mag. of Nat. Hist.

THE IMPROVEMENT OF SOCIETY.

The following judicious remarks are extracted from an excellent work lately republished in this country, entitled "The Advancement of Society in Knowledge and Religion; by JAMES DOUGLAS, Esq.

"On every side new powers are springing up available for the uses of humanity, and these powers are at the disposal of charity to multiply, to direct, and to improve. The Press alone baffles all calculations of its consequences, and requires but a right direction of its efforts to produce a result of good of which no eye could see the limits, no thought could compute the sum. In Great Britain and America this influence has reached a height beyond the conjecture of former years, and writings increase in number and importance with a rapidity beyond example. The number of readers increase in proportion; the opinions of all classes are formed by books; and an authority may be exerted by means of the Press over the general mind, which has had no precedent in the times that are past, nor will be thoroughly understood till it becomes manifested in some future and unexpected example. Education, even where it is opposed, is extending itself, and a revolution is begun in that power which of itself is able to cause a revolution in every thing else. All begin to read—all will in the end begin to think, and those laws and institutions which were intended for the use of the unthinking must give place to new ones. Voluntary associations are giving new strength to the frame of society, and infusing a new spirit into it, and bringing those subjects which once seemed placed beyond the reach of individuals into secure and every day attainment. But improvements are not only perfected but every where extended. The Hindoos have now their Newspapers, and the remotest Barbarians their schools; and the first symptoms are every where apparent of the change that is spreading through every climate, and which will at last be visible to the utmost verge of the habitable Earth.

An improvement is taking place in the mutual action of society upon itself; the influence, and the progress which those of the lower extremity of the social scale are now making, will accelerate the effect upon those immediately above them, and the speed of every class will be augmented from the fear of being overtaken. The extremes of society are done away. There are no longer hereditary bondsmen, deprived of all hope of ascending in the scale whatever might be their moral worth or industry; and there are no hereditary classes, privileged to inactivity and folly, and exempted, by their high rank, from the loss of consideration by their loss of character; but public opinion is brought to bear upon all; and all, by heavy penalties, are

made to feel themselves responsible. Thus Society has gained a doubly accelerating force; the improvements that are adopted by the higher classes are emulously caught, and rapidly transmitted to the lower, and the advancement of the latter urges a new progress upon the former, and those who have least in their power are still enabled to return in part the benefits they receive. The school of Arts instituted for the instruction of Mechanics, will ultimately have the effect of spreading and advancing the knowledge of Natural Philosophy among all ranks of the community. A knowledge of the elements of mechanical and chemical science, from the example held out by workmen in towns, will be judged essential to the ordinary course of education, and become prevalent in every method of instruction. The demand created by these schools for teachers will give encouragement to young men prosecuting philosophical studies, and afford them an opportunity of discovering whatever powers they may possess. That patronage and incitement which governments ought to hold forth in aid of scientific knowledge will, in some measure, be supplied by the contributions which are raised by the operative classes; and the openings which their instruction will afford to rising merit may compensate for the want of the fostering care which the rulers of this and other countries ought to have bestowed on the abstract research of truth."

EARLY NAVIGATORS.

Before the invention of the mariner's compass, the Phœnician, the Greek, and the early Italian navigators were compelled to creep from headland to headland, without venturing to quit the shore, excepting when an island so near, as to be distinctly seen from the continent, offered them an equally secure retreat from the violence of an accidental tempest. Yet we know that the bolder Norwegians, though exposed to far greater perils, from the habitual inclemency of a high northern latitude, and from the frequent cloudiness of their atmosphere, were in the habit of attempting, and often with success, a voyage of some length upon the ocean. It would be unjust to tax with temerity a spirit of enterprise, which so often accomplished its object; it must therefore be supposed, that a patient observation of natural phenomena, attention to the flight of migratory birds, and to the direction of currents, and some few simple devices, which, being no longer necessary, are now forgotten, must have served as substitutes for the more valuable sources of modern navigation. Of one of the devices here enumerated, Arngrim Jonas

relates an interesting anecdote. He tells us, that when Flok, a famous Norwegian navigator, was going to set out from Shetland for Iceland, then called Gardarsholm, he took on board some crows, *because the mariner's compass was not yet in use.* When he thought he had made a considerable part of his way, he threw up one of his crows, which, seeing land astern, flew to it; whence Flok, concluding that he was nearer to Shetland, (perhaps rather Faroe,) than any other land, kept on his course for some time, and then sent out another crow, which, seeing no land at all, returned to the vessel. At last, having run the greatest part of his way, another crow was sent out by him, which, seeing land a-head, immediately flew for it; and Flok, following his guide, fell in with the east end of the island. Such was the simple mode of steering their course, practised by those bold navigators of the stormy northern ocean. The ancient natives of Taprobane (Ceylon) used the same expedient when skimming along the tranquil surface of the Indian ocean.—*Lit. Gaz.*

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By E. BLISS, No. 111, Broadway.

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from the best authorities. With representations of the various inhabitants in their respective costumes.

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BY HENRY C. SLEIGHT, Clinton Hall.

Murray-St. Lectures. Common School Manual. In press shortly to appear, Ainsworth's Dictionary, by Dymock, revised by Professor Anthon, with additions.

Errata in No. 5.

Page 195 line 10 from bottom ; for " cannons" read *canons.*
" 196 line 8, for " studies," read *duties.*
" " 15, for " lay," read *long.*
" " " 19, for " elevation," read *devotion.*
" 197 " 8, from bottom ; for " study," read *duty.*
" " 5, from bottom ; insert *but* after the semicolon.